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BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. VII JULY, 1936 No. 3

THE WHITE STORK AS A SUBJECT OF RESEARCH[1]

By ERNST SCHÜZ

Vogelwarte of Rossitten of the Kaiser Wilhelm Society for the Promotion of Science

THE White Stork (*Ciconia ciconia*), as a striking and confiding bird of large size, is especially adapted for many lines of research. For a long time the Vogelwarte of Rossitten has been engaged in studying it, for this station is situated in that part of Germany that is richest in Storks, namely East Prussia.

1. DISTRIBUTION

The numbers of this beautiful bird vary greatly, as has been shown by the surveys made in different places in Germany since the beginning of this century. Recently there has been an increasing number of observers in this field, and many countries have a considerable literature on their Stork populations. It is most important that these surveys should be taken from a uniform point of view, and, if possible, in the same years, so that a comparison can be made over as large a territory as possible.

My project of an "International Population Survey in 1934" met with a cordial response, and hence we now possess for that year a good insight into the Stork population of all of Germany, Holland, Denmark, the Schonen district of Sweden, Switzerland, Austria, Czechoslovakia, parts of Poland and Latvia, and also the Spanish Province of Avila. Omitting Latvia (the figures for which have not yet been reported), the total count comes to about forty-five thousand pairs. In Germany 30,730 pairs with 64,772 fledged young were recorded, of which more than half—16,602 pairs with 33, 751 young—belonged to East Prussia, while western and southern Germany is very poor in Storks. In East Prussia an average of 44.5 pairs of Storks nest per one hundred square kilometers. Even more favorable is the Memel region just to the north—formerly a part of East Prussia—for here 69.1 pairs bred per one hundred square kilometers. The highest concentration is that reported by Count Wodzicki for the Rudki county in the Wojewodschaft

[1]Translated from the German by Margaret Morse Nice.

Lemberg (Lwow, Poland) with 105.8 pairs per one hundred square kilometers.

It is interesting to follow by means of the figures the dependence of the Stork on environmental conditions, especially food supply. The opportunities for nesting are also of great significance, and these are largely dependent on man. While in northwestern Germany the preference for thatched roofs is striking (in Schleswig-Holstein the ratio of thatched to tile roof was 87:3.5), in eastern Germany (East Prussia and Silesia) the "tile roof is used as often as the thatched, but usually with the aid of an artificial support. Man must compensate with this help for the lack of thatched roofs. Tree nests are rare in many countries, but in others common, as in Upper Silesia (90 per cent) and in Checkish Silesia and Moravia (91 per cent). Here again man has an influence, for in the regions with nests on trees the inhabitants have the custom of placing the artificial support on trees rather than on roofs. Holland has a large number of pole nests (27.1 per cent), where the support is placed on isolated high poles.

2. Fluctuations in Numbers

The numbers of Storks vary much from year to year. We have now reached a maximum which will probably not continue for long. Apparently there was a minimum about 1928, after which came a striking increase. Not everywhere, however: in Switzerland which had about one hundred pairs at the beginning of the century, the population dropped to 17 pairs by 1927, since when it has continued to decrease with 13, 10, 11, 11, 10, and 7 pairs in 1935, and several of these raised no offspring. Saxony, which reached a minimum in 1928 of only 13 pairs, quadrupled its population in a few years: 13, 15, 19, 22, 28, 37, and, in 1934, 54 breeding pairs!

Two sorts of influences must be distinguished. The spread of civilization with its dangers from drainage, high-power lines, etc., is injurious, especially along the borders of the range. On the other hand, in the regions where Storks are common and real competition occurs, it is chiefly the food supply and weather that are the decisive factors.

In fact we see great differences in the reproduction-coefficient (number of young fledged per nest) according to the favorableness of the year as well as of the situation. The average number fledged in Thuringia in 1934 was 3.6, but in the Memel region (with sandy soil) only 1.7. In East Prussia it was 2.7 in 1931, but in the drought year 1934, 2.0. The question remains to be investigated as to how far changes in the weather of a periodic nature influence the population.

3. Food

The food of the Stork is of special interest to the hunter in those

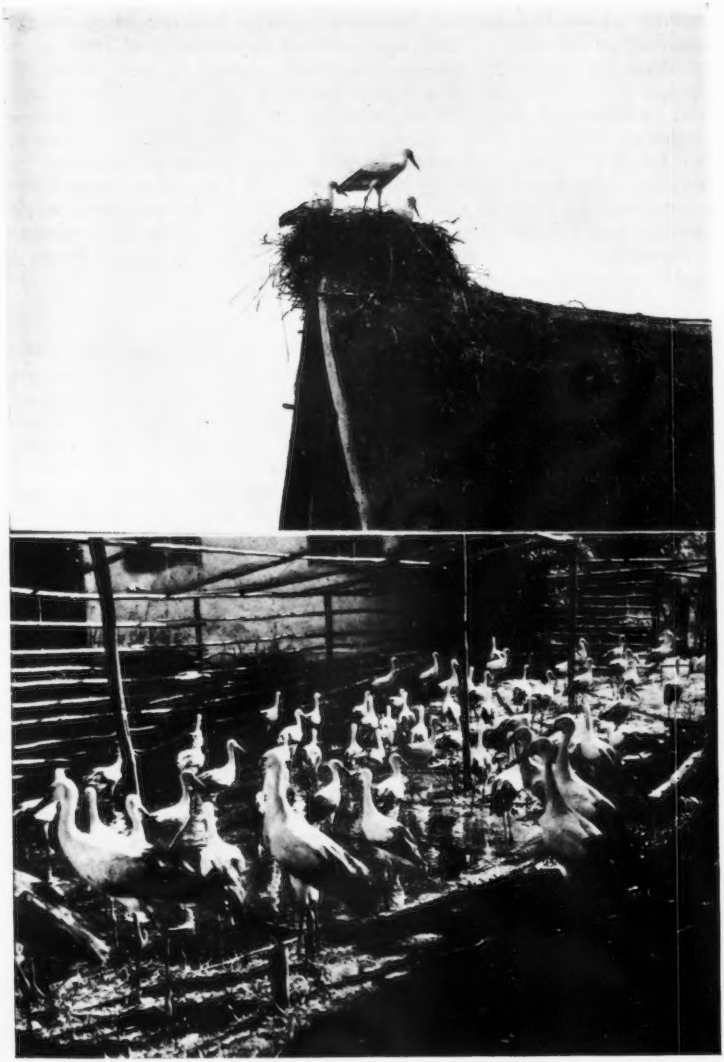

FIGURE 1
A TYPICAL STORK NEST IN EAST PRUSSIA.

FIGURE 4
A VIEW OF THE EXPERIMENTAL STORKS OF THE VOGELWARTE OF ROSSITTEN.

regions where this bird is common. Large number of stomach-analyses on the part of the Vogelwarte of Rossitten give little or no evidence for the harmfulness of the Stork, except in rare instances. On the other hand we have many proofs of the importance of this bird as wholesale destroyer of mice (for instance in the great mouse plague of 1930 and many other times) and of many kinds of insects. Beetles of all kinds and grasshoppers are devoured in numbers, as well as insignificant-looking larvæ. A Stork had eaten more than seven hundred larvæ of saw-flies (*Tenthredinidæ*) for one meal, while another had the remains of over seventy May-beetles (*Melolontha*) in its stomach. On its wintering grounds in South Africa the Stork is highly regarded as the "Locust Bird".

4. MIGRATION

The migration of the White Stork in Europe is peculiar, since the birds that nest east of the Weser River travel round the east end of the Mediterranean to reach eastern South Africa—a distance of over ten thousand kilometers—while the more westerly Storks reach Africa by going through southern Spain. It would seem that some at least of these western Storks reach eastern Africa, for a dart found in a Stork killed in Spain is believed by ethnologists to have come from a Negro tribe inhabiting Kenya. Yet we know for certain that some Storks occur in the west in tropical Africa. We are anxiously awaiting further recoveries.

5. NESTING

The breeding biology of this bird, particularly from the standpoint of behavior, is a fascinating subject. In East Prussia the Stork arrives at the beginning of April, usually the male first and a few days later the female. As a rule an old nest is adopted, a set laid by the end of April and hatched in thirty days. The young stay some nine weeks in the nest and are typically altricial, during the first weeks lying flat in the nest on the approach of a person, thus allowing themselves to be easily ringed. Migration occurs about the middle of August, and in about seventy per cent of the cases the young leave several days before their parents, the latter sometimes renewing courtship activities at this time just before their departure.

The nest plays a very important role in the home life of the Stork. One often has the impression that it is first the nest that is defended and second the mate. Very remarkable are the fights that regularly take place over nests that are already occupied. And even when excellent nests are present in the vicinity ready for adoption! The fact of the occupation of a nest by a pair of Storks seems to present a challenge to strangers of the species, and it is a curious fact that at times the intruders drive out the rightful owners, yet raise no brood themselves. In the reproductive mechanism of such individuals, the instinct to possess a nest is present, but the rest of the

FIGURE 2

A TREE NEST IN EAST PRUSSIA.

pattern is lacking. These are probably two- or three-year-old birds that are not yet fully mature.

6. AGE OF BREEDING

Year-old Storks never return to the home nest. They are often found throughout the summer in their South African winter quarters. In two-year-old birds the mechanism of the reproductive activity is better developed, even if not fully so; they may at times lay claim

to nests, but do not breed. Three-year Storks often nest, but usually have fewer young than older birds, or perhaps none at all. Four-year-old Storks are nearly always sexually mature.

The large troops of "Bachelor Storks" that roam around together in the breeding season in East Prussia and roost in trees at the edge of the woods consist to only a small extent of year-old birds, but largely of two-year-old or even older individuals. Perhaps there are also old birds that fail to breed because of some pathological reason. It would be more correct to call these troops of "Bachelors" or "Robber Storks" "Stork Children."

7. Mortality of the Young

The weather appears to make little or no difference in the number of eggs laid, but often affects the number of young raised through its influence on the food supply. The smallest of the family (incubation always begins before the last egg is laid) is sometimes raised when food is plentiful, but never when it is scarce. When the little bird lies feebly on the bottom of the nest, it is no longer fed. Older young are thrown out, but as I can prove by photographic evidence, small young (for example, twelve days old and weighing 570g.) are swallowed by the parent. Sometimes several small young disappear in this manner. If all the young die, there is a strong suspicion that they have succumbed to a heavy infestation of intestinal trematodes, whose intermediate host is a frog (*Rana esculenta*).

8. Methods of Investigation

The best method for investigating the life-history of this species is to concentrate on a small area, as here in Rossitten, and study the ringed birds. We are trying to do what Mrs. Margaret Nice has done in her classical study of a small bird—*Melospiza melodia*. Naturally the technical requirements with a large bird which can hardly be ringed when adult are different—in some respects easier, in others more difficult. We can ring only the young Storks, and must plan the work with a view to the future, since the birds do not breed till several years old.

For years the Storks of the Insterburg District in East Prussia have been systematically ringed. Especially large rings with large figures are used so that they can be read with field-glasses while the birds are standing in normal fashion on the roof. In addition to the approximately fifteen hundred young Storks of this sample district, the populations of the Stolp District (Pommerania) and Kottbus (Mark Brandenburg) were ringed of late years, as well as the Storks of all Upper Silesia. Of course systematic observation must go hand in hand with this work. The rings of the different regions have different numbers and are also easily distinguishable by the form of the clasp.

FIGURE 3

THE RINGS OF THE VOGELWARTE OF ROSSITTEN.

AAA. Pelicans. AA. Swans, Golden Eagle. A. White-tailed Eagle, Bustard. B. Storks, Herons. BB. Special Rings for Researches with the White Stork. C. Medium-sized Raptores. D. Crows, Medium-sized Gulls. E. Black-headed Gulls, Lapwings. F. Starlings, Thrushes. S. Swifts, Kingfishers. G. Most Small Birds.

9. Homing Experiments

In the course of these studies, which are chiefly concerned with the instincts of this bird, the question arises as to what external and internal factors are involved in the matter of way-finding in migration. Our researches have been concerned with the fall migration of the young birds. Several years ago 196 young Storks were confined and not released till after the departure of the adult birds. With a few exceptions they found the right direction, apparently to a certain extent independently of leadership of experienced individuals.

In 1933, 133 young Storks from East Prussia were taken to west Germany and released in Essen (Rheinland) and Frankfurt (Main), thus on the other side of the "migration boundary", on the 12th of September, at a time when the native Storks had already left. These visitors from East Prussia for the most part took a southerly to southeasterly course that corresponded with the direction from East Prussia, but—with some exceptions—had nothing in common with the migration-route of the western Storks. It is noteworthy that young Storks from East Prussia that were freed at an earlier, and hence normal, time in the west, for the most part migrated to the southwest and were found in certain cases with wild Storks that presumably were acquainted with the route.

So way-finding with these birds seems to depend partly on a hypothetical inherited "instinct for direction" or some similar factor, and also leadership of more experienced birds, as well as to a small degree on the ecology of the countryside passed over. I need not emphasize the fact that no real explanation is given by the term "instinct for direction" (*Richtungstrieb*). But we must attempt to penetrate more deeply into these problems.

10. Some Practical Applications

Every scientist feels the duty not only to orient his work from the theoretical standpoint, but also to make it serviceable to his country and fellow men. That these studies offer special responsibilities and opportunities to the ornithologist is shown by the great public interest in them, for they are concerned with a bird that more than any other is closely bound up with life of the folk and that forms an integral part of the homeland.

This is felt especially keenly in Germany. Hence the Vogelwarte of Rossitten constantly receives questions as to his studies and particularly as to the possibility of reintroducing this well-loved bird in places where it formerly nested. The researches of Professor Thienemann have shown that it is possible through raising young Storks in new, yet suitable localities, to establish them there, for

some of these Storks returned in later years to breed in their adopted home. In this case there was a distance of only one hundred kilometers between places of birth and adoption. Will transplanting over greater distances (one thousand kilometers) succeed? Following the great increase in the population in East Prussia it was possible in two years to send over five hundred young Storks from East Prussia to west, middle, and south Germany. These birds were raised in many places on artificial nests by people especially suited to such work, and most of them migrated normally after about four weeks. Even if colonizing at this distance (and mostly on the other side of the migration boundary) is very doubtful, yet the raising of the birds, observations on them, and recoveries from a distance provided a great variety of interesting facts. Best of all, we were able to share our abundance of Storks in East Prussia and give many people the great pleasure of seeing the beautiful birds at close range and of watching their growth and flights.

The studies on the White Stork would not have been possible to the extent described had it not been for the help of the Vogelwarte and ornithologists of all the countries in which Storks are found. For this fine coöperation I wish to express my gratitude.

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FERTILE EGGS FROM PHEASANTS IN JANUARY BY "NIGHT-LIGHTING"[1]

By THOMAS HUME BISSONNETTE
Trinity College, Hartford, Connecticut
and
ALBERT G. CSECH
Shade Swamp Sanctuary, Farmington, Connecticut

SEXUAL activity in the autumn and winter period of normal sexual quiescence has been induced by Bissonnette (1930–1935) in Starlings and ferrets by increasing lengths of daily exposures to electric light from incandescent bulbs after nightfall. Rowan (1925–1930) with Juncos, Crows, and Canaries, Cole (1933) with Doves, Miyazaki (1934) with Mejiros, Ivanov (1935) and Kirschbaum and Ringoen (1936) with Sparrows, Benoit (1934–35) and Parhon and Caban (1935) with Ducks, Baker and Ranson (1932) with field mice, Hill and Parkes (1933) and Marshall and Bowden (1934) with ferrets, have all induced similar sexual activation during the winter periods of sexual repose. Recently Clark, Leonard, and Bump (1936) report activation of the sex glands of Pheasants, Quail, and Partridge (Ruffed Grouse) by similar procedures. But so far Cole seems to be the only one who secured fertile eggs from such experiments on birds.[2]

Poultrymen generally have obtained increased autumn and winter laying with the domestic fowl as a result of "night-lighting". Recently Professor Scott of Kansas State College of Argriculture (private communication) has induced Turkeys to lay fertile eggs in January instead of in March and April, but failed to get similar responses with Guinea-Fowl (originally native of the tropics). Others have doubtless had similar experiences with other birds.

To those interested in the management and propagation of game-birds for restocking areas for hunting, it has been a cause for dissatisfaction that, in some States at least, the legal season for shooting Pheasants opens almost on the date when most birds reared from eggs laid at the normal time reach their first full plumage. This makes it necessary to release the birds grown in captivity just at

[1]Aided by grants from the National Research Council, Committee for Research in Problems of Sex, 1935–36, and by coöperation of the Connecticut State Department of Fish and Game, in whose Sanctuary at Farmington the experiments were carried out.

[2]The following list includes the animals serving as a basis for experiments in induced sexual activity at out-of-season periods: Starling (*Sturnus v. vulgaris*), Ferret (*Putorius vulgaris*), Junco (*Junco h. hyemalis*), Crow (*Corvus brachyrhynchos*), Canary (*Serinus canarius*), Mourning Dove (*Zenaidura macroura carolinensis*), Mejiros (*Zosterops palpebrosa japonica*), Sparrow (*Passer t. domesticus*), Mallard (*Anas p. platyrhynchos*), Field Mouse (*Microtus agrestis*), Pheasant (species not mentioned), Bob-White (*Colinus v. virginianus*), Ruffed Grouse (*Bonasa umbellus*), Turkey (*Meleagris gallopavo mexicana*), Domesticated.

the time the season opens, or, if earlier, before they reach full plumage. In either case, the birds have little or no time to become accustomed to the region in which they are liberated, or to become wild enough to make good sport for the hunters.

An attempt has therefore been made to find out if Pheasants can be induced to begin laying fertile eggs in winter or earlier in the Spring, so that they may reach full plumage for liberation two weeks or more in advance of the season for hunting them.

With the consent and coöperation of Superintendent Arthur L. Clark of the Department of Fish and Game of the State of Connecticut, and of Mr. Leon F. Whitney, who has general supervision of the breeding of their wild animals, experiments were planned and were carried out at the Shade Swamp Sanctuary near Farmington, Connecticut, with this end in view. Mr. Earl E. Bailey of Trinity College, assisted with the preparation and care of the lighting apparatus.

The majority of the Pheasants at the Sanctuary were housed and fed as usual during the winter, as controls. One cock Ring-necked Pheasant (*Phasianus colchicus torquatus*) and four hen Pheasants of the same species were chosen from the flock at random and kept in a pen of the usual type. This pen was lighted by a 60-watt bulb for three hours each night, from six to nine o'clock, for the first ten days, for four hours during the next ten days, and for five hours each night thereafter. Both controls and experimental birds received normal daylight each day, and the food and other care were similar for both groups of birds.

Lighting began on December 16th and was continued into the spring and summer months. Before or during the first week in January the male bird assumed an unmistakable breeding condition of head-furnishings and plumage and was giving the mating call. Copulations began and the first eggs were laid by two of the hens on January 15th. All four hens were laying before January 25th, and four eggs in a single day were recovered frequently. Laying reached the rate of about three and a half eggs in twenty-four hours from the four hens before January 28th. Over thirty eggs were laid before February 3d, and laying continued at the same rate in spite of very severe weather till March 4th, when the laying of one hen became intermittent. She continued to lay at intervals through April 15th, but laid only about thirty eggs in that time.

Some of the controls first began to lay on April 4th; many were considerably later in doing so. On April 15th over two hundred and forty eggs had been laid by the four experimental hens, and, as the poor layer gave only about thirty eggs, the others averaged about seventy eggs each between January 15th and that date (about seventy eggs in ninety-one days or less). This is well above the

average number of eggs from pheasants under natural conditions.[3]

Settings were made in an improvised electric incubator. Thirty-seven eggs were set on February 8th and forty-six on February 24th. Settings were made under hens on March 1st and 20th.

Trouble with the electric system caused the incubators to run very irregularly. But, of the first thirty-seven eggs set, thirty-two proved fertile and began development (86.5 per cent). Of the next forty-six, twenty could still be recognized as having developed after incubation for thirty-two days when they were broken.

Of the eggs set under the hens, two eggs were rolled out of the nest and were both fertile and developing when broken. Four young chicks hatched at thirty and thirty-three days from the first fourteen eggs, set on March 1st, and eight out of twelve eggs set on March 20th hatched at twenty-four and twenty-five days of incubation.

A most interesting situation has occurred in the case of the chicks hatched at thirty days. On April 15th, just twenty-four days after hatching, these birds were far in advance of chicks hatched at the usual twenty-three-day period of incubation so far as degree of feathering is concerned. So that, while they are delayed in hatching, they were not in rate of feathering and appear to be in advance of normal in this respect. This phenomenon is being studied further.

It has, therefore, been possible to induce Pheasants of this species to lay fertile and hatchable eggs as early as January 15th–25th by this method. By timing the beginning of night-lighting and the rate of increase of its duration, it is also possible to cause Pheasants to lay at any desired time after these dates and probably even before them. The percentage of hatchability of these early eggs, as judged by those set under hens, was quite satisfactory as compared with normals.

If no insurmountable obstacles to rearing the young Pheasants hatched from these eggs arise, the problem of securing Pheasants in full plumage for release at any desired time in the early autumn is solved by this method of approach.

SUMMARY

(1) A method is described by which it has been possible to induce Pheasants to begin laying between January 15th and 25th, so that young birds may be hatched early enough to allow them to develop mature plumage well in advance of the opening of the season for legal shooting of these birds in Connecticut.

(2) The fertility of the eggs laid under these conditions was satisfactory, and hatchability was good in those set under hens.

[3] Up to June 10th, when 3 hens were still laying, over 340 eggs had been laid and, since one was killed before she laid over 30 eggs, the others must have laid about 310 eggs between January 15th and June 10th—an average of over 103 eggs each in about 147 days. Lately laying has become somewhat intermittent. This just about trebles the usual yearly egg production of Pheasants as they are kept in captivity.

(3) One setting of eggs was delayed in hatching to thirty to thirty-three days and another to twenty-four to twenty-five days or longer, instead of twenty-three days as is normal for this species.

(4) Rate of feathering was accelerated in birds delayed in hatching to thirty days as compared with that of Pheasants hatched at the normal period of twenty-three days.

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PARASITISM OF BIRD'S NESTS BY PROTOCALLIPHORA AT GROTON, MASSACHUSETTS[1]

By EDWIN A. MASON

THE study of parasitism by *Protocalliphora* which was being conducted by Mr. Charles W. Johnson, of the Boston Society of Natural History, with the coöperation of several New England banders, and which was reported by him in the *Bulletin of Northeastern Bird-Banding Association*, Vol. I, p. 52; Vol. III, p. 1; Vol. III, p. 77; Vol. V, p. 29, and in *Bird-Banding*, Vol. I, p. 169 and Vol. III, p. 26, has been continued at Groton, since his death. At the time of his passing Mr. Johnson had at the Museum the material collected during the season of 1932.

Mr. Johnson's usual procedure was to count the number of larvæ and puparia present in a nest as soon as they were received; he then placed them in covered jars to await the emergence of the flies. Later he would count the flies which had emerged and the puparia which had died, and would watch particularly for secondary parasitism by the chalcid *Mormonilla*. By this method of study it was hoped to get sufficient data to ascertain the species of flies responsible for the parasitism of the nests of birds in this section, and to determine what species were parasitic upon these flies, and to what extent. The year of 1932 was to have been the last year this particular line of study was to have been continued, but unfortunately Mr. Johnson died before he completed the work.

Upon inquiry, it was learned from Mr. Edward Wigglesworth, Director of the Boston Society of Natural History, that the Museum was at that time unable to continue this study, but that the material on hand would be made available if we cared to examine it. These examinations were made in November, and it is thought the resultant data have sufficient value to be published as a matter of record.

The parts of the following notes in quotation-marks are the rough field notes made when the nests were collected. Each original nest is given a number, as No. 1, and the handmade nests (see page 118) used by the same brood carry the same number with the addition of the letter "A" for the first nest and "B" for the second. These numbers have no relation to the numbers of the nest-boxes which are occasionally referred to.

PROTOCALLIPHORA NOTES

1932

1. "May 19. Bluebird. Nest changed, larvæ present." On its arrival at the Museum, Mr. Johnson reported it contained 46 maggots. When examined by the

[1] A contribution from the Wharton Bird-Banding Station, Groton, Massachusetts.

writer in November it contained 34 puparia; 9 flies had emerged; 25 puparia were dead.

2. "May 19. Bluebird. Nest changed, larvæ present." On its arrival at the Museum, Mr. Johnson reported that this nest contained 43 maggots, some too small to pupate. When examined in November it was found that 40 flies had emerged and 4 puparia were dead.

3. "May 24. Bluebird. Young all dead in nest; one egg infertile." Mr. Johnson reported that this nest contained 40 maggots, most of them full grown. When examined in November it contained only 4 flies, and there were only 13 puparia from which flies had emerged. The discrepancy between these and Mr. Johnson's figures was probably caused by the presence of *Attagenus piceus*. Oliv. (Dermestid beetle). These were determined by Mr. Harold S. Peters, of the Bureau of Entomology, United States Department of Agriculture.

4. "May 27. Starling. Nest changed, one larva seen on a nestling." This nest, when examined in November, contained no signs of *Protocalliphora*, but 11 thin and comparatively long light-colored maggots, contained in a vial which was with the nest in a glass jar. Mr. Peters determined these as *Ceratophyllus Sp.* (Flea larvæ).

2A. "May 30. Bluebird. Replaced nest collected, 3 larvæ observed." In November, 20 flies were found to have emerged.

1A. "May 31. Bluebird. Replaced nest collected, larvæ present." The November examination showed the nest to contain 11 puparia from which 9 flies had emerged; 2 puparia were dead.

5. "June 3. Robin. Young left prematurely; one found dead beneath." When examined in November this nest was found to contain 18 puparia; 7 flies had emerged; 11 were parasitized by chalcids. Although the chalcid flies had emerged, none were found.

6. "June 6. Starling. Brood flown a day or so." This nest contained 12 flies when examined in November. The flies were nearly all partially destroyed, very likely by the meal-worm beetle and larva which were also found in the nest. These were determined as being *Tenebrio obscurus*, Fab., and *Tenebrio molitor*, L.

4A. "June 18. Starling. Replaced nest collected, one dead nestling." When examined in November this nest contained 27 puparia from which *Protocalliphora* flies had apparently emerged; 8 from which chalcids had emerged and 16 dead ones. No flies were in the jar.

11. "June 19. Tree Swallow. Nest changed, larvæ present." In November, this nest contained 32 puparia from which 24 flies had emerged; 8 puparia were dead.

12. "June 21. Chickadee. Nest collected after the disappearance of the only nestling; one larva noticed." One fly found when examined in November.

8A. "June 23. Tree Swallow. Replaced nest collected, many larvæ present." Contained in November 74 puparia; 30 flies had emerged; 38 were parasitized by chalcids; 6 were dead.

9B. "June 25. Tree Swallow. Nest collected, *4 dead nestlings*, many larvæ." When examined in November this nest was found to contain a total of 144 puparia; one fly had emerged; 54 were parasitized by the little chalcid fly; 89 were dead. (It should be noted that this was the third nest used by this brood.)

13. "June 25. Bluebird. Nest changed, larvæ present." When examined in November it was found to contain 26 puparia; 22 flies had emerged, 4 were dead.

11A. "June 25. Tree Swallow. Nest changed, larvæ present." The November examination disclosed a total of 81 puparia in this nest; 65 flies emerged, 16 were dead.

11B. "July 2. Tree Swallow. Nest collected, brood flown." A total of 7 puparia were found when examined in November; 4 flies emerged, 3 were dead.

13A. "July 5. Bluebird. Replaced nest collected, young flown." When examined in November this nest contained 114 puparia; 88 flies, 26 puparia were dead.

14. July 11. Tree Swallow. Nest collected, *all nestlings dead*, larvæ present." This nest contained 82 puparia; 27 flies emerged, 55 were dead.

15. "July 11. Tree Swallow. Nest changed, larvæ present." The larvæ present in this nest—61 in number—failed to pupate and emerge as flies because they were too small when their supply of food was cut off by the collecting of the nest. There were also many unhatched fly eggs in the nest.

16. "July 14. Bluebird." In November this nest contained 40 puparia; 3 flies emerged, 37 were dead.

17. "July 15. Tree Swallow." This nest contained 98 puparia, 94 of which were dead; there were 3 from which flies may have emerged, and 1 in which was a dead fly.

17A. "July 19. Tree Swallow." This nest contained 39 puparia; 11 flies emerged, 28 were dead.

16A. "Aug. 1. Bluebird." A total of 35 puparia were found in this nest; 26 were parasitized, 9 were dead.

17B. "Aug. 1. Tree Swallow." This nest was parasitized 100 per cent, 9 of the 10 puparia still containing chalcid maggots when examined, as follows:

1	contained	44
2	"	29
1	"	27
1	"	20
1	"	17
1	"	8
1	"	5
1	"	3
	Total	153

It will be noted that in the above data the different forms of *Protocalliphora* and of the secondary parasite *Mormoniella* are not distinguished, but, while this may be unfortunate, it is not thought greatly to reduce the value of the determinations.

The study of this subject as continued in the years 1933, 1934, and 1935 at Groton, was along slightly different lines, and, as always, the saving of the nestlings from death by the parasites was the primary thought in mind. The practice of substituting a hand-made nest for the original one, and again subsequently substituting others when necessary, had so proved its value in the saving of nestlings that it was continued, and further reference will be made to this subject later in this paper. When a nest was changed or finally collected after the nestlings had flown or had died, the material was examined, the number of maggots and puparia present counted, and a record kept. The maggots and puparia were then immediately destroyed.[2] This precluded the possibility, of course, of keeping a close check upon the secondary parasitisms, although a slight check on this phase was made by keeping a few nests in jars; otherwise the data collected are similar to those acquired from Mr. Johnson's method of study. By this method it is

[2]During the latter part of the season of 1934 and since the middle of June, 1935, the suggestion made by Mr. Lewis O. Shelley, of East Westmoreland, New Hampshire, that *Protocalliphora* puparia be saved in order to build up the population of the secondary parasite *Mormoniella*, has been acted upon.

still possible to determine to what extent *Protocalliphora* flies are present, and to make comparisons between different times of the nesting season, between individual nests, between nests of different species and between years.

The cumulative data covering the species most closely studied, are presented in Table I. Other host species of *Protocalliphora*, which were less thoroughly studied and on which the data collected are less conclusive, are Robins and Chickadees.

TABLE I

Host Species	*Broods hatched*	*Broods from which members left nest*	*Total of nests both original and substituted examined*	*Total of larvae and, or, pupavæ found*	*Average per nest examined for season, May 17 to Aug. 27*	*Average for first half of season, May 17 to July 7*	*Average for second half of season, July 8 to Aug. 27*	*Highest number found in an individual nest*	*Lowest number found in an individual nest*	*Average number per broods hatched per season.*
1932										
Tree Swallow	7	5	10[3]	628	63	67	58	144	7	89
Bluebird	6	5	9	376	42	43	37	114	11	62
Starling	3	3	3	40	13	..	..	27	1	13
1933										
Tree Swallow	9	5	24	1,176+	49+	49+	0	250+	0	130+
Bluebird	5	5	11	403+	36+	35+	38+	88+	0	80+
House Wren	14	14	14	80	5.71	..	..	33	0	5.71
1934										
Tree Swallow	8	8	25	1,197+	47+	45+	65+	100+	0	149+
Bluebird	7	6	18	726+	40+	44+	30+	115	0	103+
House Wren	14	12[4]	14	74	5.28	..	..	41	0	5.28
1935										
Tree Swallow	9	9	27	1,933+	71+	76+	35+	430	0	214+
Bluebird	12	9[5]	31	1,091	35	28	45	160	0	91
House Wren	11	11	11	47	4.27	..	..	37	0	4.27
Starling	2	2	2	50	25	..	..	50	0	25

CASE HISTORIES

Number 1

Bluebird. No. 3, located in cowyard.

May 20. 5 eggs.

May 29. Hatched (5 nestlings).

June 1. Nest No. 7 collected: 60 medium and a few very small maggots. Estimated total 85 plus.

June 6. Banded 5 nestlings. The nestlings seemed a little cold and hungry.

June 6. Nest No. 7A collected: 13 large and 80 plus very small maggots.

June 14. Brood (4) dead a few days. As the nestling unaccounted for was too small to leave the nest of its own volition, it must have been removed, either dead or alive, from the nest.

June 14. Nest No. 7B collected: 21 mostly large maggots.

As the nest examined at the time the dead nestlings were found (No. 7b) contained only 21 maggots, mostly of large size, and one

[3]Sixteen nests were sent to Mr. Johnson, but no trace could be found of six of them.

[4]The two instances in which no member of the brood left the nest after successfully hatching, were accounted for by other reasons than the presence of *Protocalliphora*.

[5]See the three case histories which follow.

N.B. The figures which are given with the plus sign are estimated either wholly or in part.

nestling had disappeared from the nest, at least three possibilities present themselves.

The first is, that a predator (a Sparrow Hawk seen about the nest is suggested) harried the nest, carried off one nestling, and frightened the adults, causing them ultimately to desert the nest.

The second possibility, and a very unlikely one, is, that a nestling died from some cause or other, and the parents carried it away and later deserted the nest.

The third possibility, and perhaps the most likely one, is that the early, heavy infestation of *Protocalliphora* weakened the nestlings to such an extent that changing the nest did not give them sufficient respite, and the 21 large maggots, probably ones that remained fastened to the nestling's bodies when the nest was changed on June 6th, and so were placed back in the box when the birds were returned to the new nest material, continued to weaken the birds by their blood-sucking operation, finally causing death.

Number 2

Bluebird. Located on a pole between barns.

July 3. 4 eggs.
July 8. Hatched about 2 days (2 nestlings).
July 10. Nest No. 21 collected: about 70 very small maggots.
July 16. Nest No. 21A collected: about 110 medium to large maggots, mostly large, and a good many smaller maggots too small to count, estimated at 160 plus. One nestling dead and the other very feeble.
July 20. Nest No. 21B collected: 18 medium to small maggots. One dead nestling.

When the number of maggots feeding on this small brood is considered (248 plus), it leaves little room for doubt that the efforts made to minimize the effects of the maggots by changing the nest twice were unavailing in this particular case.

Number 3.

Bluebird. No. 6, situated in the cowyard.

This nest was robbed 4 days after hatching.

Tables II and III, which follow, are based on Table I. Table II gives the totals by host species for the four-year period. Table III gives the totals for each species for each individual year.

TABLE II.

	Broods Hatched	*Broods from Which Members Left Nest*	*Total of Nests Both Original and Substituted Examined*	*Total of Larvae and/or Puparia Found*
Tree Swallow (*Iridoprocne bicolor*)	33	27	86	4,934
Eastern Bluebird (*Sialia s. sealis*)	30	25	69	2,596
House Wren (*Troglodytes a. aëdon*)	39	37	39	201
Starling (*Sturnus v. vulgaris*)	5	5	5	90

TABLE III.

	Total Larvæ or Puparia Found	*Average Number per Broods Hatched*
Tree Swallow:		
1932	628	89
1933	1,176	130
1934	1,197	149
1935	1,933	214
Bluebird:		
1932	376	62
1933	403	80
1934	726	103
1935	1,091	91
House Wren:		
1932	0	0
1933	80	5.71
1934	74	5.28
1935	47	4.27

A case history covering the brood from which the highest number of maggots ever collected was taken is inserted herewith. It is interesting to note that the host species is the Tree Swallow.

Tree Swallow. No. 1. Located in the cowyard.
May 20. 2 eggs.
June 11. Hatched (4 nestlings).
June 14. Nest No. 14 collected: no maggots found.
June 21. Banded 3 nestlings: one dead nestling.
June 21. Nest No. 14A collected: 415 medium to small, mostly medium, and 15 large maggots. Total 430.
July 3. Nest No. 14B collected: 12 puparia. (Brood gone safely.)

Whatever the factors are which govern the adult *Protocalliphora* fly at the time it decides where and when to deposit its eggs, the data accumulated over the four years, and presented in the foregoing tables, prove that the Tree Swallow is the preferred host species in the area covered by this study.

Tree Swallows, and Bluebirds, the second common host species, are the only species endangered at this station by parasitism of *Protocalliphora*, and it is, of course, the large numbers of larvæ in the individual nest that endanger the lives of the nestlings. The other species found to have been the host of this fly, evidently are not preferred hosts, and a probable reason for the discrimination between the various species is the difference in nest-construction. When one observes the maggots squirming around in a dense mass about an inch below the cup of a nest, and sees the straw surrounding this active mass all broken into small pieces, it is not difficult to determine what it is that makes the loose stick nest say of the House Wren undesirable to *Protocalliphora*, and why it is that the Tree Swallow and the Bluebird are the preferred hosts. The color protection given the eggs of the fly by the usually white

feathers of a Tree Swallow nest, may also be a factor in the preference shown by *Protocalliphora* for the nests of this species.

While on the subject of preferred hosts and the reasons why they are selected, it may be well to add that it is very rare to find, in a nest collected after the brood has flown, maggots so small as to be not matured enough to pass into the puparium stage successfully, and hence valueless to perpetuate the species. This points to a highly efficient degree of selection of suitable sites for depositing eggs on the part of the female fly of *Protocalliphora*. There is ample indication that eggs are deposited up to the time the nestlings are half grown, but after that period this is evidently a rare occurrence.

The technique employed in the attempt to minimize the debilitating effects of the larvæ of *Protocalliphora* upon nestling birds of hole-nesting species, has gradually evolved into its present status as part failures pointed to flaws. The practice is not now perfect, but it is undoubtedly helping enormously to offset the depredations of this parasite. As an aid in understanding the subject matter of this paper, and in the hope that a knowledge of the technique may prove of value to others, a description of the successive operations is here given.

With the aid of a calendar-pad and a record of the condition of all occupied nests, it is possible in most cases to ascertain within a day or two the time of hatching of a particular brood. About four or five days after a brood has hatched, a visit is made to the nest. The nestlings are removed from the nest into a strawberry-basket, the basket being covered with something to protect the nestlings from winds and sun, and is placed upon the ground while the actual changing of the nest takes place. The original nest is swept out from the box into a double sheet of newspaper, care being taken not to spill any of the smaller particles usually found near the bottom of the nest box. This material is then tied into a tight bundle and is preserved to await examination later. Next comes the job of nest-making according to the best birdlike practices possible. A hank of soft hay can be tightly wound from one end, as though one were attempting to make a flat mat, working from the middle outwards, and subsequent hanks attached as the previous one is used up, until a big handful is secured. This is placed in the nest-box in a horizontal position, and should spring outward and upward when released. It should then be moulded with the clenched fist until a cavity is formed, and presto, the hank of hay has been turned into something like a bird nest which is accepted by the birds.

The adults are trapped when they enter the box to feed on the fifth or sixth days after hatching, and the male is caught first if possible. This practice applies chiefly to Bluebirds and Tree Swallows. Wrens, because they are less easily alarmed and because the sexes cannot be identified by their plumage, can very well both be caught on the same day.

Four or five days after the first changing of the nest, or eight or nine days after hatching, the nest should be again removed and another new one substituted. At this time the nestlings can be banded before being returned to the box.

As the nestlings at this stage are usually fairly large and vigorous, they are able to withstand the attack of a brood of *Protocalliphora* maggots, should eggs be deposited in the new nest by the fly, or if a few maggots persist from previous hatches on the bodies of the nestlings, and accordingly the nest is now left undisturbed until the nestlings have flown. The period of adolescence is usually not longer than twenty days, and so twelve days or so are allowed from the date of the second nest-changing until the last nest is finally collected. The practice of changing nests applies only to Tree Swallows and Bluebirds. In the case of other species the original nest only is collected, and that after the brood has flown.

SUMMARY OF TECHNIQUE

1. Determine date of hatching.
2. Four days later, collect original nest and substitute a new one.
3. Fifth or sixth day, trap-nest adult male. (In the case of Wrens trap both adults.)
4. Sixth or seventh day, trap-nest adult female.
5. Eighth or ninth day, change nest and collect second nest, and band nestlings.
6. Approximately twenty days after hatching, brood having flown, collect final nest.

The desirability of building up a large population of the chalcid *Mormoniella* to provide a natural check on *Protocalliphora*, makes it advisable to give this little fly every opportunity to complete its cycle on its host the *Protocalliphora* puparium, as pointed out by Mr. Shelley. Thus while it is desirable to destroy by burning all maggots found in the earlier nests collected, it is not desirable to destroy them after the period has arrived when they are likely to be parasitized by *Mormoniella*. Therefore from about the middle of June on, all maggots large enough to pupate and all puparia are placed in a tight box in the top of which is an aperture covered with mosquito wire which will allow the small chalcid flies to escape, but which will retain the larger *Protocalliphora flies*. This box can be used until such time as the first *Protocalliphora* fly makes its appearance, and then, so as to avoid the flies escaping, another box should be used.

As a means of illustrating what happens inside such a box as the one referred to above, the data on check broods of *Protocalliphora* placed in jars covered with cheese cloth are given here:

Nest No. 24.

Aug. 3 (1933).	18 puparia placed in jar.
Aug. 18 (A.M.).	1 fly emerged.
Aug. 19 (A.M.).	10 flies emerged.
Dec. 20.	The jar was examined and the contents were as follows:
	12 dead *Protocalliphora* flies.
	5 puparia from which chalcids had emerged.
	1 *Protocalliphora* puparium which contained 15 chalcid larvæ.
Total	18

Nest No. 8B.

June 23 (1934).	55 puparia and 25 large maggots placed in jar.
July 4 (A.M.).	3 flies emerged, still with gray bodies.[6]
July 8 (about).	Approximately 20 were estimated to have emerged.
July 18.	Some puparia still whole, and some from which chalcids had emerged.

The above data indicate that the secondary parasite has flies emerge the same year the egg was laid, but this does not happen in the majority of cases. The greatest number of chalcids come from larvæ which winter in *Protocalliphora* puparia, and emerge the following year. To substantiate this statement, a quotation is made here from notes made on the box containing the puparia collected from nests during the summer of 1934 and held over winter. "On June 17, 1935, a great many chalcid flies were in the box, and apparently were still emerging. They were scattered over the sides and in the bottom." The notation was also made at the time that there had apparently been a continuous emergence since about the middle of May, gradually increasing in intensity, and probably reaching its peak about the beginning of June. The box had been under observation since early May. On June 21st none were to be seen in the box, and about this time the first flies (chalcid) were noticed in nests. There seems to be a coinciding peak-emergence of both *Protocalliphora* and the secondary parasite *Mormoniella* about the middle of June.

Viewing the data from Table I by species, it is clearly shown in Table III that a constantly increasing number of larvæ or puparia have been observed. There is an ascending scale over the period except in the case of the House Wren, that either proves *Protocalliphora* is more abundant, or that a greater degree of efficiency has been obtained in recording the numbers present. It would seem that the latter has probably occurred to some degree, but, on the other hand, it is doubtful if to the extent the tables indicate. It is, therefore, most likely that *Protocalliphora* has increased in numbers at this station during the period under consideration.

[6]The flies attain normal steel-blue color an hour or so after emerging.

Protocalliphora is proved to be present at this station in large numbers. It seems fairly safe to assume that this parasite is present in such numbers that were it not for the steps taken to minimize its effect on the hole-nesting species, almost no Bluebird or Tree Swallow youngsters would ever fly from the nest-boxes at this station. This assumption is supported by the losses sustained during the period here reviewed (for example, see case-histories No. 1 and No. 2), and the losses sustained prior to this study and before the cause of the trouble was known. It should be mentioned in passing that occasionally a factor contributing to mortality from the activities of *Protocalliphora* is encountered in the form of inclement weather. A few consecutive days of wet and cold weather reduce the available food supply, and so lower the resistance of the nestlings to a point less than normal. It is on such occasions that an unusually high mortality may be expected.

The conclusions arrived at in the preceding paragraph are discouraging. An element of hope, however, is not lacking, since the adverse conditions obtaining at this station do not appear to be general. While reports of parasitism by *Protocalliphora* do come from other stations, and while the extent of its range and the results of its depredations have not been reported with any degree of thoroughness, it is known that a great many broods of Tree Swallows and Bluebirds do successfully leave their nests, even in our general region. There is thus presented a picture of spotty range and/or intensity of the *Protocalliphora* population. What the controlling factors are as yet is unknown to us.

Groton, Massachusetts.

RETURNS OF BANDED BIRDS: SECOND PAPER[1]

(Shorebirds, Waxwings, Shrikes, Vireos, Warblers, Doves, and Pigeons)

By FREDERICK C. LINCOLN

IN the first paper in this series[2] the data presented were (with a few exceptions) of birds recaptured at points other than that of banding. This will be the primary object throughout the series, but occasionally it may be desirable to include a few station returns, as when the species involved is one for which any kind of a "retake" is more or less of an occasion of note.[2]

For the purpose of providing a variety of interest, the present

[1] Correction: Recoveries of Banded Birds of Prey. *Bird-Banding*, Vol. VII, p. 44, January, 1936. In the first paper of this series two unfortunate errors were made as a result of using an old atlas for the purpose of computing distances. The atlas used was the Rand McNally 1915 edition, which shows the town of La Verne in Marin County. Apparently there is another town of this same name in Los Angeles County, and this is the one that figured in the recovery records of Screech Owls Nos. 290939 and A600862. Accordingly, the distance between points of banding and recovery for the former is about three miles and for the latter about two miles.

[2] Recoveries of Banded Birds of Prey. *Bird-Banding*, Vol. VII, No. 1, pp. 38–45, January, 1936.

paper lists records from a miscellaneous group, including game species on which there is an open shooting-season, other game-birds that are accorded year-round protection in the United States and Canada, and still others that are not generally considered as game in any part of their ranges.

For the latter group, recovery records, that is, recaptures at points other than those of banding, probably always will be decidedly uncommon, if not actually rare, but ultimately, when it is possible to put into operation plans that are now made, it is hoped that banding stations in Latin-American countries will result in a greatly increased station-to-station recovery percentage.

It should be remembered that the data presented in the following tables do not necessarily constitute all of the records for the species that are now contained in the files of the Biological Survey. In the great majority of cases they represent but a fraction of the usable data. Selection has been made because the record indicates some hitherto unknown fact in the movements of the species or because of some other feature of unusual interest. Under the name of each species notation is made of the total number that have been banded and the number of returns now contained in the files. These figures are as of July 1, 1935.

WILSON'S PLOVER. *Pagolla wilsonia*

Banded, 24. Returns, 1.

A226261, banded at Bird Bank, Charleston Co., S. C., on July 6, 1931, by E. Milby Burton, was shot at Rose Hall Village, Carentyne Coast, Berbice, British Guiana, on September 22, 1932.

KILLDEER. *Oxyechus vociferus*

Banded, 1422. Returns, 13

254254, banded at Chickasaw, Iowa, on July 13, 1926, by Charles J. Spiker, was found dead in Fayette County, Iowa, in May, 1930.

486565, banded at Noblesville, Ind., on July 17, 1927, by Malcolm F. Bundy, was killed in Plaquemine Parish, La., on December 26, 1927.

A222471, banded at Notre Dame, Ind., on July 12, 1929, by D. K. Stephenson, was caught at Gaffney, S. C., on February 27, 1930.

A281957, banded at East Durham, N. Y., on June 7, 1932, by Vernon Haskins, was killed at Milledgeville, Ga., on January 10, 1933.

A289342, banded at Little Bow Reservoir, Carmangay, Alta., on June 17, 1933, by Dr. and Mrs. J. E. Horning, was shot at Wamego, Kan., on October 22, 1933.

RUDDY TURNSTONE. *Arenaria interpres morinella*

Banded, 20. Returns, 1.

A217098, banded at Zion, Ill., on September 4, 1929, by C. E. Holcombe, was shot at Lat. 89°, Long. 30°, Bayou Scofield, La., on October 10, 1929.

WOODCOCK. *Philohela minor*

Banded, 95. Returns, 7.

244598, banded May 8, 1932, at Fort Snelling Reservation, Minn., by Dr. T. S. Roberts, was killed at Ocean Springs, Miss., on January 7, 1933.

287099, banded July 9, 1926, at LaCrosse, Wis., by T. M. Marshall, was killed at Baton Rouge, La., in December, 1928.

A408449, banded December 16, 1932, at Fairhope, Ala., by Mrs. W. H. Edwards, was shot at Sydney, Nova Scotia, on October 31, 1933.

WILSON'S SNIPE. *Capella delicata*
Banded, 58. Returns, 3.

241721, banded at Colquitz, Vancouver Is., B. C., on December 23, 1924, by J. A. Munro, was killed at Sumas Lake, B. C., on October 20, 1927.

B319966, banded at North Eastham, Cape Cod, Mass., on September 4, 1932, by O. L. Austin, was shot at Buck Island, 4 miles south of Coinjock, Currituck County, N. C., on January 12, 1933.

LONG-BILLED CURLEW. *Numenius americanus*
Banded, 53. Returns, 21.

531112, banded at Bear River Bay, 20 miles west of Brigham, Utah, on June 11, 1929, by Archie Hull, was shot at Ensenada de Todos Santos, Mexico, on September 18, 1930.

A502303, banded at Antioch, Neb., on June 9, 1931, by F. J. Keller, was found dead at Palacios, Texas, on February 8, 1932.

SPOTTED SANDPIPER. *Actitis macularia*
Banded, 1743. Returns, 6.

63244, banded at Boxford, Mass., on July 1, 1923, by S. G. Emilio, was found dead under telephone wires at Babson Park, Needham, Mass., on July 5, 1927.

A134132, banded at Zion, Ill., on August 23, 1929, by C. E. Holcombe, was found and released at Raleigh, N. C., on September 27, 1929.

F117228, banded at Wantagh, N. Y., on August 19, 1933, by William Vogt, was killed at Fort de France, Martinique, French West Indies, on September 13, 1933.

WILLET. *Catoptrophorus semipalmatus*
Banded, 167. Returns, 2.

A435411, banded 30 miles southeast of Brooks, Alta., on July 6, 1932, by Dr. J. E Horning, was found dead at Hamilton, Mo., on September 3, 1932.

GREATER YELLOW-LEGS. *Totanus melanoleucus*
Banded, 70. Returns, 1.

34-347178, banded at North Eastham, Cape Cod, Mass., on October 9, 1934, by Oliver L. Austin, was shot at Plainville, Mass., on October 20, 1934.

LESSER YELLOW-LEGS. *Totanus flavipes*
Banded, 116. Returns, 1.

B234496, banded at North Eastham, Cape Cod, Mass., on August 14, 1933, by O. L. Austin, was shot at Barbados, British West Indies, on August 23, 1934.

RED-BACKED SANDPIPER. *Pelidna alpina sakhalina*
Banded, 75. Returns, 1.

169170, banded at Shell Point, Wakulla Co., Fla., on October 31, 1926, by H. L. Stoddard, was found dead at Monroe Marshes, Mich., on May 25, 1927.

SEMIPALMATED SANDPIPER. *Ereunetes pusillus*
Banded, 3776. Returns, 22.

L1986, banded at North Eastham, Cape Cod, Mass., on August 29, 1933, by O. L. Austin, was caught by boys at Carupano, Venezuela, on September 24, 1933.

BAND-TAILED PIGEON. *Columba fasciata*
Banded, 85. Returns, 5.

536342, banded at Beaver, Ore., on May 21, 1932, by Reed W. Ferris, was killed at Callaboos Canyon, Calif., on December 8, 1932.

536368, banded at Beaver, Ore., on May 24, 1932, by Reed W. Ferris, was shot 15 miles east of Gonzales, Monterey Co., Calif., on December 10, 1933.

536415, banded at Beaver, Ore., on May 29, 1932, by Reed W. Ferris, was shot at Monterey Hills, Calif., on December 10, 1933.

MOURNING DOVE. *Zenaidura macroura*

Banded, 12,636. Returns, 697.

104374, banded at Fort Riley, Kans., on June 13, 1926, by Leon L. Gardner, was killed at Austin, Texas, during season of 1929–30.

212300, banded at Indianapolis, Ind., on June 30, 1924, by Margaret R. Knox, was shot at Tampa, Fla., on September 10, 1930.

217026, banded at Valparaiso, Neb., on September 20, 1929, by Harry Parker, was shot at Corpus Christi, Texas, on November 10, 1929.

365539, banded at San Diego, Calif., on January 3, 1929, by E. H. Glidden, was killed at Boise, Idaho, on September 7, 1929.

368129, banded at Lakewood, Ohio, on August 30, 1926, by E. C. Hoffman, was killed at Fullerton, La., on January 18, 1933.

411872, banded at Notre Dame, Ind., on June 22, 1927, by Brother Alphonsus, was killed at Ashburn, Ga., on January 29, 1931.

436770, banded at East San Diego, Calif., on March 11, 1929, by Frank F. Gander, was killed at Reno, Nev., on September 10, 1929.

439847, banded at East Lansing, Mich., on April 27, 1928, by Prof. J. W. Stack, was shot 8 miles east of Beaufort, N. C., on December 23, 1932.

440583, banded at Clayton, Ill., on May 29, 1928, by Russell S. Davis, was killed at Sargent, Texas, on November 27, 1932.

520964, banded at East Lansing, Mich., on May 24, 1928, by Prof. J. W. Stack, was shot 20 miles south of Blountstown, Calhoun Co., Fla., on December 8, 1930.

522300, banded at Kansas, Ill., on August 18, 1927, by W. B. Taber, Jr., was killed 4 miles northeast of Alapaha, Ga., on March 14, 1931.

527140, banded at Greensburg, Ind., on June 24, 1929, by Mrs. J. F. Goddard, was killed 85 miles south of Jackson, Miss., on December 14, 1930.

527353, banded at East Lansing, Mich., on April 22, 1930, by Prof. J. W. Stack, was caught by a cat at Redwood, Miss., in December, 1932.

527564, banded at Whiting, Kans., on July 9, 1933, by Homer W. Hedge, was killed 2 miles east of Davilla, Texas, on January 1, 1934.

593591, banded at Marietta College, Marietta, Ohio, on April 7, 1932, by H. R. Eggleston, was killed at Trenton, S. C., on November 30, 1933.

546301, banded at Topeka, Kans., on June 28, 1927, by Lawrence I. McFarland, was killed at Mexico City, Mexico, on April 17, 1932.

649990, banded at Kansas, Ill., on May 10, 1929, by W. B. Taber, Jr., was killed at Morriston, Fla., on January 1, 1931.

650823, banded at North Eastham, Cape Cod, Mass., on September 2, 1931, by O. L. Austin, was killed at Laxley, Ala., on November 14, 1931.

650931, banded at North Eastham, Cape Cod, Mass., on July 28, 1932, by O. L. Austin, was shot at Tifton, Ga., on January 31, 1935.

A310673, banded at Mooreland, Ind., on May 20, 1929, by L. D. Felton, was killed at York, Fla., on January 27, 1931.

A323552, banded at Mooreland, Ind., on May 30, 1929, by L. D. Felton, was killed at Ravenden, Ark., on September 5, 1934.

A360205, banded at Fairdale, N. D., on June 21, 1931, by Frank J. Vejtasa, was killed at Crowley, La., on December 12, 1931.

A401942, banded at West Lafayette, Ind., on April 19, 1930, by Prof. Louis A. Test, was killed at Odessa, Fla., on November 20, 1931.

A402617, banded at Tiffin, Ohio, on July 23, 1929, by Eugene C. Stacy, was killed at Frostproof, Fla., on November 1, 1930.

A404145, banded at Wauwatosa, Wis., on April 24, 1929, by Mrs. Nellie B. Abraham, was killed at Bell, Fla., on November 26, 1931.

A404551, banded at Russiaville, Ind., on June 10, 1931, by Lowell E. Carter, was killed in De Witt County, Texas, on October 14, 1933.

A405833, banded at Hillsdale, Mich., on August 27, 1929, by Frank Smith, was killed at Statesboro, Ga., on January 23, 1933.

A407555, banded at Kansas, Ill., on May 14, 1930, by W. B. Taber, Jr., was killed in Zapata County, Texas, on October 15, 1930.

A413931, banded at Notre Dame, Ind., on June 16, 1931, by Brother Paul, was shot 6 miles west of Ozark, Ala., on January 28, 1932.
A418386, banded at Crystal Bay, Minn., on June 1, 1930, by Mr. and Mrs. F. W. Commons, was shot at Victoria, Texas, on October 24, 1931.
A422178, banded at North Eastham, Cape Cod, Mass. on August 26, 1930, by O. L. Austin, was shot at Ocala, Fla., on January 17, 1931.
A423800, banded at Athens, Ohio, on July 10, 1931, by Mrs. Marjorie Lee Guest, was killed in Pickens County, S. C., on January 24, 1934.
A424716, banded at Gates Mills, Ohio, on June 14, 1932, by S. Prentiss Baldwin, was shot 15 miles northwest of Gainesville, Fla., on November 30, 1933.
A424722, banded at Gates Mills, Ohio, on July 13, 1932, by S. Prentiss Baldwin, was killed in Wayne County, N. C., on January 1, 1933.
A426443, banded at North Eastham, Cape Cod, Mass., on June 13, 1931, by O. L. Austin, was killed at Dandridge, Tenn., on November 21, 1931.
A426897, banded at Kansas, Ill., on June 22, 1932, by W. B. Taber, Jr., was killed at Iota, La., on November 18, 1932.
A427701, banded at Madison, Wis., on August 2, 1931, by George Wagner, was shot at Karnes City, Texas, on October 21, 1931.
A427706, banded at Madison, Wis., on August 3, 1931, by George Wagner, was killed at Union Springs, Ala., on December 28, 1931.
A428186, banded at Charlotte, Mich., on May 21, 1932, by F. E. Ludwig, was killed at Crowley, La., on December 18, 1932.
A433011, banded at Waseca, Minn., on June 15, 1933, by Constance A. Everett, was killed at Abilene, Texas, on September 15, 1934.
A437592, banded at Fargo, N. D., on August 2, 1934, by H. Gordon Heggeness, was killed at Skidmore, Texas, on October 1, 1934.
A439401, banded at Columbus, Ohio, on March 13, 1932, by Mrs. Margaret M. Nice, was shot at Wenona, N. C., on December 15, 1932.
A441113, banded at Waterloo, Mich., on August 22, 1932, by F. E. Ludwig, was killed at Lyons, Ga., on November 25, 1932.
A441762, banded at Sioux City, Iowa, on July 4, 1932, by Mrs. Marie Dales, was killed at Altus, Okla., on September 26, 1932.
A445335, banded at Nashville, Tenn., on September 13, 1932, by Mrs. Arch Cochran, was killed in Treutlen County, Ga., on January 31, 1934.
A431742, banded at Shelby, Mich., on June 24, 1931, by David J. Davis, was killed 5 miles south of Sugar Land, Brazos River, Texas, on October 13, 1932.
A433269, banded at Chestnut Hill, Pa., on June 25, 1931, by Charles Platt, was killed at Four Oaks, N. C., on December 20, 1931.
A452664. banded at North Eastham, Cape Cod, Mass., on August 23, 1934, by O. L. Austin, was killed at Echo, La., on January 12, 1935.
A452665, banded at North Eastham, Cape Cod, Mass., on August 23, 1934, by O. L. Austin, was killed in Norfolk County, Va., on December 24, 1934.
A507090, banded at Hewlett, L. I., N. Y., on May 12, 1932, by Carl W. Buchheister, was killed at Rockingham, Ga., on December 24, 1932.
A518381, banded at Jamestown, N. D., on September 25, 1932, by Mrs. Marjorie Lee Guest, was killed at Elloree, S. C., in fall of 1932.
B266580, banded at Augusta, Mich., on July 12, 1933, by Homer L. Bradley, was shot 8 miles southeast of Lake Charles, La., on January 7, 1934.
B330872, banded at Key West, Fla., on January 4, 1932, by William W. Demeritt, was shot 3 miles south of Decatur, Ill., on September 12, 1932.
B330873, banded at Key West, Fla., on January 4, 1932, by William W. Demeritt, was killed 5 miles north of Danville, Ky., on September 6, 1932.
B331115, banded at Niles, Mich., on August 7, 1934, by Joseph R. Hradel, was killed in Refugio County, Texas, on October 20, 1934.
B333215, banded at Antwerp, Ohio, on June 30, 1933, by O. E. Ehrhart, was killed at Isabel, La., on January 7, 1934.
B342726, banded at Fairmount, N. D., on June 7, 1932, by G. C. Bierens, was killed at Cartazar, Guanajuato, Mexico, on October 19, 1932.

B373356, banded at Racine, Wis., by B. L. von Jarchow, on August 9, 1932, was killed at La Grange, Ga., on September 20, 1932.
B381158, banded at Key West, Fla., on October 19, 1932, by William W. Demeritt, was killed at Walton, Texas, on November 20, 1933.
B383291, banded at Key West, Fla., on March 19, 1933, by William W. Demeritt, was killed at Iva, S. C., on September 4, 1933.
B385345, banded at Ann Arbor, Mich., on June 18, 1933, by Harry W. Hann, was shot at Summerfield, Fla., on November 20, 1934.
C312108, banded at Celina, Ohio, on June 18, 1933, by Paul Forsthoefel, was shot 8 miles west of Statesboro, Ga., on November 23, 1933.
C335254, banded at Key West, Fla., on October 8, 1934, by William W. Demeritt, was killed at White Oaks, Ga., on January 25, 1935.
34-307922, banded at Key West, Fla., on December 7, 1934, by William W. Demeritt, was killed at Merida, Yucatan, Mexico, on January 12, 1935.
34-319808, banded at Kellogg Estate, Augusta, Mich., on May 27, 1934, by Homer L. Bradley, was killed in Liberty County, Texas, on October 16, 1934.
34-319861, banded at Augusta, Mich., on June 7, 1934, by Homer L. Bradley, was killed at Savannah, Ga., on February 15, 1935.

BOHEMIAN WAXWING. *Bombycilla garrula*
Banded, 434. Returns, 4.

B153849, banded at Waukegan, Ill., on March 23, 1932, by William I. Lyon, was found dying at Milwaukee, Wis., on April 11, 1932.
B153871, banded at Waukegan, Ill., on March 25, 1932, by William I. Lyon, was captured and kept as a pet, at Craik, Sask. Bird caught on April 15, 1932, but died on May 1, 1932.

CEDAR WAXWING. *Bombycilla cedrorum*
Banded, 7739. Returns, 86.

A227062, banded at Trumansburg, N. Y., on July 14, 1930, by J. W. Large, was found dead at Upper Black Eddy, Pa., on November 5, 1930.
B148030, banded at North Eastham, Cape Cod, Mass., on May 12, 1931, by O. L. Austin, was killed at Girard, Ala., on January 3, 1933.
B192846, banded at North Eastham, Cape Cod, Mass., on October 5, 1933, by O. L. Austin, was killed at Williamston, N. C., on March 23, 1934.
34-179972, banded at Modesto, Calif., on February 24, 1935, by Charles H. Feltes, was found dead at Seattle, Wash., on July 20, 1935.
35-101358, banded at Modesto, Calif., on March 10, 1935, by Irl Rogers, was found dead enmeshed in poultry netting, at Olympia, Wash., on June 10, 1935.
35-108386, banded at Modesto, Calif., on May 9, 1935, by Charles H. Feltes, was found dead at Victor, Wash., on August 1, 1935.

NORTHERN SHRIKE. *Lanius borealis*
Banded, 173. Returns, 9.

A214218, banded at Hepburn, Sask., on July 4, 1931, by Philip Siemens, was found dead at Cross Timbers, Mo., on September 23, 1931.

LOGGERHEAD SHRIKE. *Lanius ludovicianus*
Banded, 1014. Returns, 24.

A137040, banded at Whittemore, Mich., on June 9, 1929, by Norman O. Sibley, was found injured, died soon after, at Ramer, Ala., on September 5, 1929.
A280215, banded at Amenia, N. D., on April 7, 1932, by H. L. Chaffee, was killed at Chriesman, Texas, on November 8, 1932.

RED-EYED VIREO. *Vireo olivaceus*
Banded, 754. Returns, 8.

C84230, banded at Lansing, Mich., on July 26, 1931, by H. S. Bartholomew, was found dead at Harbor Beach, Mich., on July 30, 1931.

YELLOW WARBLER. *Dendroica æstiva*
Banded, 3223. Returns, 121.

A36074, banded at Sault Ste. Marie, Mich., on May 30, 1926, by M. J. Magee, was retrapped at the station of banding on May 29, 1929.

B75077, banded at Sioux City, Iowa, on May 17, 1929, by Mrs. Marie Dales, was killed by automobile at Sioux City, Iowa, on June 18, 1932.

B8834, banded at Sault Ste. Marie, Mich., on May 20, 1928, by M. J. Magee, was killed by automobile at Sault Ste. Marie, Mich., on June 28, 1934.

C7329, banded at Wolfville, Nova Scotia, on June 25, 1929, by Ronald W. Smith, was found evidently run over by automobile, at Wickwire Hill, Kentville, Nova Scotia, on July 5, 1933.

MYRTLE WARBLER. *Dendroica coronata*
Banded, 6788. Returns, 65.

B41909, banded at Gastonia, N. C., on February 2, 1930, by John L. Beal, was shot at Kings Creek, Cherokee County, S. C., on December 25, 1930.

F80373, banded at Fargo, N. D, on October 2, 1932, by Prof. O. A. Stevens, was found dead at Clarence, La., on December 5, 1932.

H03040, banded at North Eastham, Cape Cod, Mass., on April 30, 1932, by O. L. Austin, was caught by cat at North Harpswell, Maine, on October 19, 1932.

AUDUBON'S WARBLER. *Dendroica auduboni*
Banded, 2088. Returns, 105.

F25558, banded at Santa Cruz, Calif., on February 7, 1931, by Mrs. L. B. Payne, was found dead at Glenwood, Calif., on November 15, 1931.

BLACK-THROATED GREEN WARBLER. *Dendroica virens*
Banded, 372. Returns, 4.

C92, banded at Hanover, N. H., on September 16, 1930, by Raymond R. Marsden, was found dead at Milledgeville, Ga., on February 25, 1935.

H91583, banded at Groton, Mass., on May 24, 1933, by William P. Wharton, was caught at West Memphis, Ark., on October 22, 1933.

CHESTNUT-SIDED WARBLER. *Dendroica pensylvanica*
Banded, 419. Returns, 1.

A65059, banded at Holderness, N. H., on June 25, 1926, by Mrs. Katherine C. Harding, was retrapped at Station of banding on July 3, 1927.

PINE WARBLER. *Dendroica pinus*
Banded, 839. Returns, 26.

F35800, banded at North Eastham, Cape Cod, Mass., on August 4, 1931, by O. L. Austin, was retrapped at station of banding on April 16, 1934.

PALM WARBLER. *Dendroica palmarum*
Banded, 393. Return, 9.

H27223, banded at Elmhurst L. I., N. Y., on October 13, 1932, by Mrs. Marie V. Beals, was caught at Dunn, N. C., on January 15, 1933.

H44302, banded at North Eastham, Cape Cod, Mass., on October 9, 1932, by O. L. Austin, was caught in house in Point Verde, Placentia, Newfoundland, on November 28, 1932. Both these dates have been verified.

YELLOW-THROAT. *Geothlypis trichas*
Banded, 3267. Returns, 28.

C2085, banded at Oliverea, N. Y., on May 15, 1929, by Mrs. Florence K. Daley, was retrapped at station of banding on August 15, 1930, on May 16, 1931, and on May 10, 1932. Note that this bird returned each year for three successive years.

C98951, banded at Bowdoinham, Maine, on July 16, 1931, by Ray M. Verrill, was retrapped at station of banding on July 5, 1934.

REDSTART. *Setophaga ruticilla*
Banded, 2527. Returns, 20

B86035, banded at Groton, Mass., on May 18, 1929, by William P. Wharton, was retrapped at station of banding on May 11, 1932, also May 17, 1933.

C13865, banded at Wolfville, Nova Scotia, on July 12, 1929, by Ronald W. Smith, was retrapped at station of banding on June 30, 1930, also on June 25, 1931.

In the preparation of these papers, the author desires to acknowledge his indebtedness to Miss May T. Cooke of the Biological Survey, who has personally examined thousands of cards for the purpose of selecting the cases desirable for presentation.

Biological Survey, Washington, D. C.

GENERAL NOTES

Homing Experiments with Golden-crowned Sparrows.—I have read with interest that portion of the reviews in the January (1936) issue of *Bird-Banding* having the sub-heading, "Homing Experiments."

This article gives as the longest winter return known, that of a Gambel Sparrow released at a distance of 34 miles from where trapped. (E. L. Sumner, Jr., and J. L. Cobb, *Condor* 30:317–319.)

I have a record of a winter return from a distance of 84 miles by a Golden-crowned Sparrow (*Zonotrichia coronata*) in November, 1933. Of course, November is not usually considered a winter month, but as these sparrows breed in Alaska and British Columbia (never, so far as is known, in California) I think we may call the following a winter return. I quote as follows from my record book:

"Twenty-eight Golden-crowned Sparrows were trapped at the University of California Botanical Gardens, Strawberry Canyon, near Berkeley, California, on November 7, 8, 9, 1933; kept in small cages in the Life Sciences Building on the university campus until the morning of November 10th. Miss Mary M. Erickson of the Museum of Vertebrate Zoölogy and I then placed the twenty-eight birds in paper cartons covered with mosquito netting, and drove in my car to a point on the North Fork of the Calaveras River, in Calaveras County, California, about two miles south of San Andreas. This is at an elevation of about 1,000 feet and is about 84 miles a little north of east from Berkeley. At this place Miss Erickson and I released the birds which immediately flew across the river to trees on the opposite bank. There are grass-covered hills on each side of the river, dotted with oaks and pines. In the river bottom are willows, and, near by, sycamores and other trees. We left Berkeley at 8.30 A.M., and released the birds the same day at 1 P.M." Here follows a list of the results of interest:

The records show that one of these Golden-crowned Sparrows, C102090, was recaptured by me on November 27th, seventeen days later, close to where it was first trapped. The same bird repeated in the same location several times during the next few months. This record is interesting because the bird presumably flew across north and south migration routes to its chosen wintering ground. I recaptured three more of these twenty-eight Golden-crowned Sparrows at the Botanical Gardens in September and October, 1934, after which time I ceased banding in Strawberry Canyon.—E. L. Sumner, Menlo Park, California.

The Homing Instinct of Song Sparrows.[1]—Although much is known of the migratory habits of many birds, and the tendency of some species to return to the same haunts year after year is familiar, yet we are still very ignorant of the mechanism of this ability, or indeed, of the degree to which given species possess it. During the past two years the author has carried on banding operations on a

[1] From the Department of Zoölogy, Syracuse University, Syracuse, New York.

small scale in connection with a study of the blood parasites of birds (particularly the malarias), and it was observed that Song Sparrows (*Melospiza melodia melodia*) were not only caught repeatedly, but that they always returned to the particular location where the original capture was made (Manwell and Herman, *Bird-Banding*, 6:133–134). This was true even when other traps were in the line of flight, and the fact that the birds were always carried in closed containers made no difference with their ability to find their way back. This fact led the author to try liberating the birds at various points some distance from the city, and it was found that although they were always carried in closed containers, and were in several instances liberated at dusk when it was nearly dark, some of them were nevertheless able to find their way back to the point of original capture. The points at which the birds were released ranged from a mile and a half from the point of capture to thirty-five miles, and in several instances the same bird was liberated several times at different points and at different distances—sometimes in one direction from the city and sometimes in another. A summary follows:

Of a total number of thirty-two Song Sparrows captured during the spring of 1936 and liberated at Lyman Hall, Syracuse University, twelve were recaptured once, one three times, one six times, and one seven times. Four had been originally captured at the same location the previous year, and the bird (34-140217) which was recaptured six times this year had been captured five times in 1935. The bird (34-140209) which was recaught seven times during the present year had been trapped eight times the previous spring. Three birds (34-140217, 34-140253, 34-140275) were liberated at a point nine miles east of the city and were recaptured two, three and twenty-one days later respectively at the point where they were originally taken (which is about one and a half miles from the University). These same birds had been on numerous other occasions liberated at the University. Another bird was liberated about two miles south of the city and was recaught twelve hours later at the point where it was caught to begin with. One of the three birds just referred to (34-140217) was subsequently caught and taken to Chittenango, a village about fifteen miles east of Syracuse. After liberation there, it returned and was caught again at the original point of capture thirty-six hours later. It was then taken to Cortland, a city about thirty-five miles south of Syracuse, and released. It was again recaught six days later. These experiments, though not carried out on many birds, show very definitely that Song Sparrows possess a strong homing instinct, and that the ability to return home cannot depend on a memory of things seen. Since some birds were caught many times and frequently, others a few times and more rarely, and still others only once (one was captured once in the spring of 1935 and once this spring) it is clear that this sense of locality varies greatly in different birds, and it is probable that some tend to range more widely than others.—Reginald D. Manwell.

An Eastern Chipping Sparrow at Least Eight and One-half Years Old at Summerville, South Carolina.—Eastern Chipping Sparrow (*Spizella p. passerina*) B37036, which was banded by me on March 27, 1928, at Summerville, was taken by me as a return for the fourth time on March 3, 1936. This bird was not taken in the winters of 1929, 1930, 1934, and 1935, and so can be called only a Return-4W. Its age, however, is evidently at least eight and one-half years, which is two years older than any other Chipping Sparrow I have taken. The bird appeared to be in good condition, and had no indication of having suffered from the foot disease which so often maims this species.—William P. Wharton, Groton, Massachusetts.

A Black-capped Chickadee Victimized by the Eastern Cowbird.—Dr. Herbert Friedmann reports a single case of the victimizing of the Black-capped Chickadee (*Penthestes a. atricapillus*) by the Eastern Cowbird (*Molothrus a. ater*) in his book "The Cowbirds" (1927), and points out that the specific identity of the Chickadee of that record is open to question.

On May 25, 1936 a Black-capped Chickadee's nest, containing four Chickadee eggs and two Cowbird's eggs, was found in a nesting box at the Austin Ornithological Research Station at North Eastham, Massachusetts. Chickadee 35-10224, banded here January 14, 1936, was trapped on the nest June 6th. On that date the Cowbird eggs hatched, and one of the Chickadee eggs was missing. Two Chickadees eggs hatched on June 8th, at which time one of the young Chickadees was found dead and the second was missing from the nest on June 10th. The remaining Chickadee eggs did not hatch. The young Cowbirds were banded June 13th, and removed to the laboratory for parasitological study on June 16th.

The opening in this box was one and one-half inches in diameter, much larger than the usual entrance to Chickadee nests, and ample to permit the intrusion of Cowbirds. The presence of the Cowbird eggs may account for the reduced clutch laid by the Chickadee.—Fred M. Packard, North Eastham, Cape Cod, Massachusetts.

RECENT LITERATURE

(Reviews by Margaret Morse Nice)

The articles have been selected and arranged under subjects of importance to students of the living bird, and also for the purpose of suggesting problems, or aspects of problems, to those banders who wish to make the most of their unique opportunities.

Headings in quotation marks are the exact titles of articles or literal translations of such titles. Except in the case of books, which are always reviewed under their titles, headings not in quotation marks refer to general subjects, or are abbreviated from titles in foreign languages. References to periodicals are given in italics.

BIRD-BANDING

"The 'British Birds'—Marking Scheme. Progress for 1935."—H. F. Witherby. 1936. *British Birds*, 29:339–344. During 1935, 46,430 birds were ringed in Great Britain, of which 16,066 were trapped, the rest being nestlings. The species that have been ringed in largest numbers since 1909 are: Song Thrush (*Turdus philomelus*) 53,108; Blackbird (*Turdus merula*) 42,469; Starling (*Sturnus vulgaris*) 37,592; Swallow (*Hirundo rustica*) 34,243; Lapwing (*Vanellus vanellus*); 27,928; Chaffinch (*Fringilla crlebs*) 19,684; Greenfinch (*Chloris chloris*) 19,643; Redbreast (*Erithacus rubecula*) 17,008. Fourteen coöperators ringed from 1,007 to 5,205 birds in 1935, H. J. Moon's list being the largest. Dr. Moon's "total this year is the second largest he has ever done and is very remarkable in being made up of nestlings not to be found in colonies. His largest totals are Song-Thrush (1,262), Lapwing (970), Blackbird (877), Starling (379)."

Banding at Rossitten.[1] A summary of the varied phases of work of the Vogelwarte, both educational and scientific. During the past year 114,300 birds were ringed and 3000 recoveries and returns reported. An illustration is given of rings carried by five of the oldest banded birds, Herring Gulls (*Larus argentatus*) of 21, 22, 23, almost 25, and 26 years old. The activity of this station and its coöperators is attested by the bibliography of fifty titles of articles published in 1935.

"Bird Banding."—1936. Bureau Biological Survey, Washington, D. C. Wildlife Research Leaflet BS-53. 5p. A brief account of banding in North America, telling of its history and methods, describing bands and traps, and concluding with a few words as to the value of the work. Nearly 2,250,000 birds have been banded on this continent.

"How a Small Banding Station Functions."[2]—M. Mountfort describes the pleasure and interest derived from trapping in his garden. In two years he has trapped nearly five hundred birds of thirty-eight species. He is gathering data on weights of birds and also on homing. Some individual Titmice are captured

throughout the year, but others visit his garden only in winter, five birds of two species—Crested Tit (*Parus cristatus*) and Blue Tit (*Parus cæruleus*)—being present two winters in succession. Homing experiments with two Blue Tits revealed a strong attachment for the winter home; one returned from the distance of a kilometer in one to three days, the other from three kilometers in two days, and five kilometers in six days. M. Mountfort should use colored bands on some of his regular visitors.

"Banded Birds as Prey of Raptorial Birds."[3]—In a region of some five square kilometers near Dresden where considerable banding is being done and many nest-boxes are provided, and where nine pairs of Tawny Owls (*Strix aluco*) live, the author found that forty-one ringed birds had been eaten by five of these pairs in two years. Fourteen species were taken, the majority of individuals being Tit-mice. Cases of cannibalism in families are also cited—one young Long-eared Owl (*Asio o. otus*) and two young Sparrow Hawks (*Accipiter nisus*)—this last event taking place after the mother bird had been shot.

"Abnormalities in Birds."—H. and J. R. Michener. 1936. *Condor*, 38:102–109. A valuable article summarizing the cases of tumors, sickness, injuries, and albinism in the thirty thousand Passerine birds banded by the authors in Southern California during the last ten years. There have been one hundred fifty cases of tumors, mostly on the feet and legs. An "injured leg is no major loss to a bird." "Deformed bills are almost as common as injured legs." Instances of albinism, except with English Sparrows (*Passer domesticus*), amounted to only ".05 of one per cent of the total."

[1] Schüz, E. 1936. XXIX. Bericht (1935) der Vogelwarte Rossitten der Kaiser Wilhelm-Gesellschaft zur Förderung der Wissenschaften. *Vogelzug*, 7:68–78.
[2] Mountfort, G. R. 1936. Comment fonctionne une petite station de baguage. *L'Oiseau et la Revue française d'Ornithologie*, 6:321–326.
[3] Lüders, O. 1936. Beringte Vögel als Raubvogel-Beute. *Vogelring*, 8:44–53.

HOMING EXPERIMENTS

"Homing Experiments with Starlings and Swallows in 1935."[4]—Dr. Rüppell has obtained even more striking results on homing than in his earlier studies, having sent his subjects by airplane to Sweden and London, and to points in Germany at distances of more than four hundred miles. Fifty-two of 97 nesting Starlings (*Sturnus vulgaris*) were known to have returned to their homes after having been sent to localities from 275 to 707 kilometers distant (one station being in Sweden). *The best percentage of return* (75.9 *per cent*) *was from the greatest distance.* Of seven Swallows (*Hirundo rustica*) sent to London (690 kilometers) five were recaptured at their nesting place. Of six Martins (*Delichon urbica*) sent to Gleiwitz (725 kilometers) five returned. In order to test the theory that homing is a matter of kinaesthetic memory, some of the Starlings were rotated during the journey on clockwork some forty-five times a minute; nevertheless these birds returned better than the others. We eagerly await further developments of these brilliantly planned and executed experiments.

Homing experiments with Tree Sparrows (*Passer montanus*).[5]—Of six European Tree Sparrows released in winter near Gronau in Hannover, 2.5 kilometers from home, three returned; of six released 11 kilometers away, one returned; but of three released 15 kilometers away, two returned.

Other homing experiments are mentioned in No. 2.

[4] Rüppell, W. 1936. Heimfindeversuche mit Staren und Schwalben 1935. *Journal für Ornithologie*, 84:180–198.
[5] Simon, E. H. 1936. Verfrachtungen von Feldsperlingen (*Passer montanus*). *Der Vogelzug*, 7:78–79.

LONGEVITY

"Age Determination in the American Crow."—J. T. Emlen, Jr. 1936. *Condor*, 38:99–102. First-year birds have more pointed tail-feathers than adults, and their flight and tail feathers show more wear. The author implies, but does

not definitely state, that first-year birds do not breed. He says the *younger* birds generally weigh more than adults, an observation contrary to the data of L. E. Hicks in *Bird-Banding*, 6:65–66, 1935.

An Eight-year-old Hairy Woodpecker (*Dryobates villosus*) is reported by R. H. Carter, Jr., from Muscow, Saskatchewan, in *Inland Bird Banding News*, Mar., 1938, 8(1):10.

Several records of long life in banded birds are given in *News from the Bird-Banders*, 11, No. 2, May 1936, Berkeley, Calif.; California Towhees (*Pipilo c. crissalis*) of almost seven and almost nine years, and House Finches (*Carpodacus mexicanus*) of six and seven years, while a third was banded nine years ago.

See No. 1 for longevity records of Herring Gulls.

WEIGHT

"The Number of Contour Feathers in Passeriform and Related Birds."—A. Wetmore. 1936. *Auk*, 53; 159–169. Actual counts of the feathers of some one hundred fifty birds are given, and also the weights of plumages and of the birds. The maximum number of feathers was found in winter, "the complete, dense plumage" of winter being acquired in late fall.

LIFE HISTORY

"Habits of the Rook."—J. W. Campbell. 1936. *British Birds*, 29:306–309. In a rookery in Essex courting and "love-flights" are conspicuous throughout October and "may also occur throughout the winter months whenever the weather is fine and sunny. Autumnal courting displays are not confined" to *Corvus frugilegus*, the author having often seen them indulged in by Ravens (*Corvus corax*) and Jackdaws (*Coleus monedula*). Territorial jealousy increases after incubation starts, the female hampering "the construction of new nests near her own." "Any disturbance among the nesting birds in the earlier stages of the breeding season has an apparently irresistible attraction for neighboring birds." When a male feeds his incubating mate, other females beg. "Such attempts are resented strongly by both members of the rightful pair, but in 1933 a male was seen on several occasions, after feeding his mate, to fly to an adjoining tree, where he fed another female. This was not a true case of polygamy, for this second female had certainly a mate of her own."

Immature birds are seldom seen at the rookery. "One or two pairs, however, construct nests each year which they usually eventually abandon. In 1934 and 1935 a pair of birds with nasal bristles successfully raised a brood of young."

"Young Rooks, Their Survival and Habits."—J. P. Burkitt. 1936. *British Birds*, 29:334–338. By means of careful counts at different times of the year, the author estimates that an average of 1.2 to 1.5 young birds are fledged from each nest; but by September the young appear to be only one-tenth as numerous as the adults, hence a great mortality must take place among the young birds in July and August, a number of young dying equal to one-third or two-thirds the population of adults.

Nesting of the Black Kite.[6]—In two pairs of *Milvus m. migrans* the males shared incubation, but quite irregularly, as may be seen from the following records:

Pair A. May 25th; watched from 3.15 A.M. to 12.30; at 4.06 male relieved female and was still on nest when observer left. May 28th; watched 3.30 A.M. to 4.35 P.M.; at 3.54 male relieved female and incubated with short pauses until 3.15, when he left, the female returning to the nest at 4.20. June 6th: watched from 2.45 A.M. till 8 P.M.; female incubated till 11 A.M., when she left and the eggs were left uncovered until 4.08, when she returned, and she was still on at 8 P.M.

Pair B. June 12th: watched 6.20 to 3 P.M.; at 6.50 female relieved her mate and was still on when observer left. June 21st: watched 3.10 to 8 P.M.; at 6.42 the male was relieved by his mate.

During incubation, the amount of food consumed seemed to be surprisingly little.

Nesting of the Honey Buzzard.—Three articles on this strange hawk (*Pernis apivorus*), which lives to a large extent on wasp and bumblebee larvae, appeared in 1935, two by German authors,[7], [8] and one by a Frenchman.[9] The birds arrive late, and the eggs are not laid until late May or early June, the young hatching when their food is abundant. Both parents incubate and brood the young. The latter are fed at long intervals—four and a half to six hours in some instances. Fresh twigs are brought until the young leave at the age of 38 to 40 days. The birds are gentle and quiet, and the young do not quarrel in the nest, as do most young hawks. At the age of a month they start to *scratch* in the bottom of the nest, an instinctive act, by means of which they will later procure their food. In the Vosges, M. Claudon reports finding several nests on which birds appeared to be incubating, but no eggs were laid.

The Nesting of the Kestrel.[10]—The female *Falco tinnunculus* incubates and the male brings food to her. The eggs hatch at practically the same time. The female at first stays constantly with the young, only leaving them to receive food from her mate. The food of one pair consisted largely of lizards.

"Egg Laying of the Cowbird During Migration."—T. D. Burliegh. 1936. *Wilson Bulletin*, 48:13–16. Eggs and young of *Molothrus ater ater* were found in nests of the Red-eyed Vireo (*Vireo olivacea*) in Asheville, North Caroloina, although no adults have been recorded in the nesting season after May 4th.

Experiments with Egg-Laying in the European Tree Sparrow.[11]—The removal of eggs from the nest of *Passer montanus* did not result in the laying of extra eggs, the female starting to incubate on as few as two eggs. The addition of other eggs did not cause the bird to lay a smaller set than otherwise. Three broods are raised; incubation lasts eleven to thirteen days, and the young stay in the nest thirteen to sixteen days.

"Three Broods of Red-backed Juncos in One Season."—L. L. Hargrave. 1936. *Condor*, 38:57–59. A banded pair of *Junco caniceps dorsalis* together raised three broods near Flagstaff, Arizona. The young of the first two broods left as soon as independent, but the last brood remained till after the parents had left.

Behavior of Lesser Spotted Woodpecker.[12]—The author took two of four female young from a nest and raised them at home. He had some difficulty in teaching them to eat in daylight, as they had been used to expect food only when the nest-hole was darkened by a parent. The sisters quarrelled constantly, *the smaller one dominating the larger.*

"Variation in the Song of Male Mockingbirds."—H. and J. R. Michener. 1936. *News from the Bird-Banders*, XI (1):5–7. A comparison of two males at the same stages in the nesting-cycle showed that one sang a very great deal and the other hardly at all. This agrees with Mrs. Laskey's experiences (*Auk*, 1935. 52:370–382).

"Starlings Fighting for Nesting Sites." G. Marples. 1936. *British Birds*, 29:321–323. Detailed descriptions of fierce fights between two males May 4th and January 26th.

"Report on the Arnett, Oklahoma, Experimental Quail and Prairie Chicken Management Project."—V. Davison. Bur. Biological Survey. Washington, D. C. Wildlife Research Leaflet BS-39. A fifty per cent loss was found in the Lesser Prairie Chicken (*Tympanuchus pallidicinctus*) "from hatching to the end of the growth period." "The male takes no part in care of the young. The sex ratio of young birds trapped for banding at five to fourteen weeks was 140 males to 100 females. Capture of banded birds usually revealed moderate but continued

movement from the original locality within a radius of one to one and a half miles. One bird was shot at a point eighty miles from the ranch."

[6] Schuster, L. 1936. Zur Brutbiologie des Schwarzen Milans. *Beitr. Fortpflanzungsbiologie der Vögel*, 12:69–73.
[7] Wendland, V. 1935. Der Wespenbussard (*Pernis apivorus*). *Journal für Ornithologie*, 83:88–104.
[8] Gentz, K. 1935. Zur Brutpflege des Wespenbussards. *Journal für Ornithologie*, 83:105–114.
[9] Claudon, A. 1935. La Bondrée apivore *Pernis apivorus apivorus* dans le département des Vosges. *Alauda*, 7:541–545.
[10] Mouillard, B. 1935. Notes sur la biologie du Faucon crécerelle *Falco tinnunculus*. *Alauda* 7:522–534.
[11] Eisenhut, E. and W. Lutz. 1936. Beobachtungen über die Fortpflanzungsbiologie des Feldsperlings. *Mitteilungen über die Vogelwelt* 1936.
[12] R. de Thomaz de Bossierre. 1935. Un Nid de Pic Épeichette, *Dryobates minor hortorum* Brelm. *Le Gerfaut*, 25:196–201.

ECOLOGY

"Nesting Ecology of Birds in High Mountains."[13]—Birds in the Alps at fifteen hundred to seventeen hundred meters above sea-level start nesting on southern exposures, but by June prefer northern exposures. Although considerable snow may fall in late June, yet the nests are usually in such well-protected situations that they come to no harm. A female Bonelli's Warbler (*Phylloscopus b. bonelli*) had been incubating eggs in an arched-over nest for four days when a snow of twenty centimeters fell; she left her eggs uncovered from 7 A.M. till 12 M. A snow of thirty centimeters fell four days later, but she continued to incubate, leaving the nest as usual at intervals of forty-five minutes to an hour, thus keeping a passage-way open. The eggs hatched in due time.

Breeding Birds in the Arctic.[14]—In northern Siberia shorebirds arrive with eggs almost ready to be laid; they nest at once, and if the weather turns very cold, the eggs may be frozen. The birds leave in August when the weather is warm and food abundant.

"Habits and Nest Life of the Desert Horned Lark."—A. D. Dubois. 1936. *Condor*, 38:49–56. In a four-year study of *Otocoris alpestris leucolæma* in Montana, larger sets were found during a very rainy season than in the other years: in the former there were seven sets of four eggs and two of three eggs; in the other three years seven sets of four eggs were found and thirty-one of three eggs. The birds are destroyed by weasels, skunks, ground squirrels, and poisoned bait.

"Redshanks Nesting at Tring Reservoirs. An Effect of the Drought."—C. Oldham. 1936. *British Birds*, 29:381–383. The drought in England in 1933 and 1934 greatly lowered the water-level of the Tring Reservoirs, so that Great Crested Grebes (*Podiceps c. cristatus*), Coots (*Fulica a. atra*), Pochard (*Nyroca f. ferina*) and Tufted Ducks (*Nyroca fuligula*) failed to nest. Swampy conditions appeared in 1935, and two pairs of Redshanks (*Tringa totanus*) nested for the first time since 1922.

"The Burrowing Owl and Dust Storms."—J. F. Brenkle. 1936. *Inland Bird Banding News*, 8 (1):2. Dust-storms filled the burrows of *Speotyto cunicularia* in South Dakota, and the droughts of 1933 and 1934 dried up the ponds, so that prey became scarce. A colony of sixteen pairs of these owls settled by a filling-station lunch-room, the attraction being a tub of water and kitchen scraps. However, in this exposed situation about a third of the adults were killed, and only nine pairs raised young, the total reaching twenty-one, an average of 2.3 per pair. The usual number of young under normal conditions is from six to twelve. In 1935 "word was received from Iowa and Minnesota that Burrowing Owls were nesting eastward where they had not been noticed before."

"Coloration of Downy Young Birds and of Nest Linings."—J. M. Linsdale. 1936. *Condor*, 38:111–117. Judging from experiences largely in western Nevada, the author concludes: "Apparently those kinds of birds which nest in exposed situations and which live in hot regions have pale or pallid nestling plumages and

nest linings which reflect and counteract the harmful effects of sun rays. Kinds which live in opposite conditions are dark in both these respects and thus are able to take advantage of warmth from the sun."

"A Tree Nesting Quail."—H. L. and R. Crockett. 1936. *Condor*, 38:97–99. In the Salt River Valley, Arizona, "at the end of the second dry year," Gambel Quail (*Lophortyx g. gambeli*) "had gathered in great numbers in irrigated places, where they found food, water and protection, but very precarious nesting places" owing to changes in water-level. One pair solved the situation by building a nest four feet from the ground in the center of a sour orange tree. "It was well constructed, of sticks, and was better lined than ground nests we have seen. We believe it was built entirely by the quail."

"Climographic Studies of Certain Introduced and Migratory Birds."—A. C. Twomey. 1936. *Ecology*, 17:122–132. By means of climographs showing the average rainfall and temperature for each of the twelve months for different localities the author points out that only where these factors are fairly similar in two localities, particularly in the breeding season, is there hope of successful introduction of any but the most adaptable of alien birds. He also shows climographs for several species for summer and winter ranges, and believes that birds "with a restricted summer range tend to seek the summer optimum of temperature and rainfall in their winter range."

"Why We Need Wild Birds and Mammals."—J. Grinnell. 1935. *Scientific Monthly*, Dec.: 553–556. Also **"Up-hill Planters."**—1936. *Condor*, 38:80–82. Delightful articles showing the interdependence of the forests and birds and squirrels. The trees supply a bountiful supply of food, while the animals distribute the acorns in new localities, and particularly up-hill.

"Wild Life and Erosion Control."—H. H. Bennett. 1936. *Bird-Lore*, 38:115–121. "Since colonial days we have, unquestionably, been guilty of the most colossal soil-wastage the world has ever witnessed in a like space of time." Already erosion "has essentially ruined for further practical use not less than 50,000,000 acres of once-fertile land, and has put another 50,000,000 acres in about as bad a condition." The Soil Conservation Service is doing splendid work in stopping erosion and bringing back habitats for wild life in their demonstration areas. A striking article on a subject of paramount importance.

[13] Heilfurth, F. 1936. Beitrag zur Fortpflanzungsökologie der Hochgebirgsvögel. Beitr. Fortpflanzungsbiologie der Vögel. 12:98–105.
[14] Scalon, W. N. 1935. Les Oiseaux du Sud du Taimir. Suite. *Le Gerfaut*, 25:201–217.

BIRD BEHAVIOR

"On the Sociology of the Herring Gull, *Larus a. argentatus* **Pont."**[15]—Each pair has a pretty sharply defined breeding territory even before the nest is built. Both birds defend the territory, the male more vigorously than the female, and each usually drives off birds of its own sex. While the male is incubating, other males may collect in his territory, but as soon as he is relieved of nest duty by his mate, he at once attacks the strangers. The territory is defended until the young are fledged. It is thus evident that "a colonial bird can also very well be a territorial bird."

Fourteen nesting birds were captured in 1934 and given colored bands; in 1935 nine were back in their old territories.

By careful observation it was ascertained that the birds of a pair know each other personally, no matter where they happen to be. That they distinguish their own young from the fifth day, was established by experiment. They do not, however, know their own eggs, but locate the nest by position. If the eggs are removed, the bird will be disturbed, but in many cases will resume "incubating" in the empty nest. "Even if the eggs are placed only 20 centimeters from the nest, the Gull hesitates, when it comes near the nest, but usually settles in the empty nest!" Yet the eggs hold a strong interest for the bird, which goes to them, settles

on them for a little, but then returns to the nest. Gulls seldom show the reaction that Terns do of pulling the eggs back into the nest. (An Arctic Tern (*Sterna macrura*) incubated an egg of an Old-squaw (*Clangula hyemalis*) in its otherwise empty nest, although when the nest was entirely empty, she preferred her own eggs, which had been placed near.) If a nest was made by the experimenter twenty centimeters from the real one and the eggs placed in it, the Gull preferred this to her own empty nest. If the eggs of a Tern are moved to the distance of a meter, the bird usually incubates the eggs and not the nest.

Herring Gulls know their mates and their young personally; these do not remain in one locality, "so *must* be known personally." "But the eggs do not leave their position and hence can be recognized by position."

"On the Winter Habits of the Green Woodpecker (*Picus viridis viridescens*)."—F. C. R. Jourdain. 1936. *Proc. Zoölogical Soc. London*, 1936. Part I. 251–256. A female Green Woodpecker roosted in a nesting-box from October 1, 1933, to April 28, 1934, but the following year she, or another bird, did not remain after February 12th. Her arrivals in the afternoon and departures in the morning were closely correlated with light-intensity, being earlier on dark afternoons than on clear, and later on dark mornings than on bright ones. The average times of retiring in 1934 were: January 14th to 20th, 4.20; January 21st to 30th, 4.23; February, 5.12; March, 5.48; April, 6.46. No information is given as to the times of sunrise and sunset. Bussmann (*Bird-Banding*, 4:33–40, 1933) reports some observations on the sleeping-habits of Black Woodpeckers (*Dryocopus martius*) with the terragraph.

"Some Diving Notes on Young Tufted Ducks, Young Velvet Scoters and Young Eider Ducks."—P. Grenquist. 1936. *Ornis Fennica*, 13:6–23. Observations on depth of dives and length of time spent under water by young and adult *Nyroca fuligula*, *Oidemia fusca*, and *Somateria mollissima*.

"Why Do Birds Migrate by Night?"[16]—Dr. Palmgren does not think that the habit of migration by night is due to the necessity of feeding by day. "In daylight the attention of the bird is fixed on the environment by means of the sense of sight. These sense impressions and the consequent stimuli to more or less involuntary reactions in response to the environment (especially feeding) dominate over the internal stimuli to migration. . . . But at night, when sight perceptions and the periodic stimulus to daily activity are lacking, the migration drive can operate unhindered."

"Nest-building Instinct in an Immature Double-crested Cormorant (*Phalacrocorax auritus auritus*).—H. L. Mendall. 1936. *Auk*, 53, 202–203. At a colony in Maine an immature male established territory and built a nest in July, 1935, although "he was greatly hindered by the fact that each time he left his territory, a certain amount of nesting material was stolen by other members of the colony." "Having completed the nest, the Cormorant guarded it jealously, and was as particular of his territorial rights as were the mature adults around him. The bird went through many of the true courtship maneuvers whenever a female flew overhead or walked by the nest."

[15] Tinbergen, N. 1936. Zur Soziologie der Silbermöwe, *Larus a. argentatus* Pont. *Beitr. Fortpflanzungsbiologie der Vögel*, 12:89–96.

[16] Palmgren, P. 1936. Warum ziehen die Vögtsel des Nacl.? *Ornis Fennica*, 13:41–49.

BOOKS

Birds of America.—Edited by T. Gilbert Pearson. 1917. Doubleday, Doran & Co., New York, Quarto, 289 pages, $3.95. The outstanding features of this reprint in one volume of the three volumes published nineteen years ago are: Fuertes' plates of the Birds of New York; inclusion of the majority of Western birds by description and drawings; the low price. Some of the plates are not so good as their predecessors, No. 33, for instance, having too little red, while No. 47 has too much. The text lacks the modern viewpoint., the descriptions do not stress

field-marks, while the inclusion of pictures of mounted specimens was a sad mistake. Ranges are given, as well as data as to nests and eggs, and also feeding habits, while many of the "biographies" are well and interestingly written. Many excellent photographs by Finley, Job, and others are included. All in all, a very good buy.

Birds of the Green Belt and the Country Around London.—R. M. Lockley. 1936. H. F. & G. Witherby, 326 High Holborn, London, W.C.1, 236 pages, 5s. A splendid guide to the birds in the vicinity of London, telling just where to go and how to get there to find birds of a dozen different habitats. In informal, charming style the author conducts us through each type of country, telling of the habits, appearance, and notes of the characteristic birds, as well as mentioning adders, toads, and other creatures. His descriptions of songs are excellent, and his comments on various phases of natural history are always interesting. Line drawings by Doris Lockley of birds and flowers add much to the usefulness of the book. A more helpful guide to the visitor from abroad could hardly be imagined.

How to Know British Birds.—Norman H. Joy. 1936. Witherby, London, 136 pages, 5s. A field guide illustrated by sketches and colored plates. The descriptions are very good, emphasizing field marks and characters, while information as to nesting and distribution is given in a few words. This book, as well as those by Mr. Lockley and Miss Turner, belongs to the admirable series of Bird-Lovers' Manuals being published by H. F. and G. Witherby.

Every Garden a Bird Sanctuary.—E. L. Turner. 1935. Witherby, London, 190 pages, 5s. The title of this book is an inspiration in itself. In this sane, readable little volume, Miss Turner, well known bird-photographer and student of life-history of birds, gives excellent advice, not only for garden sanctuaries, but also for woodland and marsh sanctuaries. She points out the ruthless advance of present-day civilization against the few remnants of wild life.

"Both directly and indirectly man is after all the greatest enemy of birds." The cultivation "of enormous tracts of hitherto waste land; huge engineering schemes for the control of water and the drainage of the marshes; . . . bungalows stretching far out into what was once pleasant country; . . . all these schemes, the inevitable result of what we call progress, are gradually strangling wild life in every land."

We very much need to take heed to her warning: "Many people do not realize how fast the net is closing around birds, nor how necessary it is to preserve our heritage."

DAVID LACK ON TERRITORY AND POLYGAMY

(Review by Thomas T. McCabe)

"Territory and Polygamy in a Bishop-bird, *Hordeacea hordeacea* (Linn.)."—David Lack, B.A., M.B.O.U. Ibis. October, 1935. 817–836. It is reassuring to find a recent and sweeping critic using the language of orthodox territorialism as confidently and in as absolute a sense as a "realtor" could use the jargon of his title-deeds. That "territory is as well developed in the male *hordeacea* as in any known bird" is true only as pending further information or as considering the phenomenon as exclusively a phase of reproduction, for there are beyond question birds of even more strict year-round territorial behavior in both sexes.

The paper draws an admirable and a spectacular picture of a dense settlement of Bishop-birds on three and a half acres of reverted tall grass land near Amani, Tanganyika Territory. At the risk of isolating and pigeon-holing elements of behavior in preconceived packages, it will give the clearest summary in briefest space if we first follow the familiar strands of the pattern, then the less familiar variations.

The territorial boundaries are rigid, and seem to be maintained through the long season, without natural markings, enclosing an average of about 925 square yards. The male finds its food inside, never leaves except to find water, "parades" the boundaries, never tolerates strangers of the same species, whether adult or immature, fights and pursues when necessary. The female does not defend the territory and incubates and feeds her young alone.

So far the familiar outlines. On the other hand the female shows no sense of boundaries whatever and is not aided by the male's defense of them in the matter of food for the young, which she seeks far and wide, under frequent attack *en route* by neighboring males. Polygamy is general but not universal. It is common for a male to have up to four females in different stages nesting in his territory at once, and more in the long breeding period between May and September, yet he does most of the nest-building, using, curiously enough, different materials from the females which assist him. While the author does not consider the matter settled, and discusses it at some length, he is inclined to believe, not that the male maintains a permanent harem, or goes forth to seek new mates when ready for them, but rather that free females are continually on the lookout for mates and territories, so that there is always a new one ready to be accepted. Nothing is said of the distribution of the females within the male's territory, except that inter-female jealousy is rare. The male has a special call which is uttered when one of his own females enters, and sometimes when she leaves, the boundaries. All birds, even the males, must go to a water-hole a few hundred yards away at least once a day, and here complete inter- and intra-specific tolerance prevails. The male is magnificently colored and continually indulges in display, which does not appear to be directed at the females but is believed to constitute territorial advertisement, taking the place of the ill-developed voice. Various widely different forms, such as Warblers and Shrikes, are tolerated in the territories. In the case of the Yellow-shouldered Bishop-bird (*Euplectes capensis sabingo*) whose territories may be superimposed on the same ground, the resident pair is tolerated but strange individuals are chased by *hordeacea*.

Here vigorous territorial behavior is obviously divorced from food-supply. It is worth noticing that the warm climate permits the female to seek food far afield with little risk to the nestlings. Yet the author inclines to find the function of the territorial organization in the regulation of mating. He remains very close to Howard as to two major aspects of the reproductive cycle—the manner of the seeking of mate by mate, and the function of territory therein.

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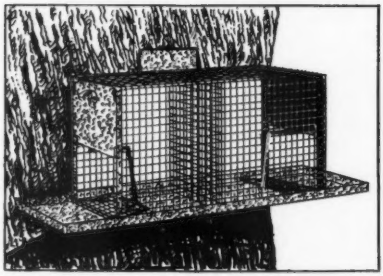

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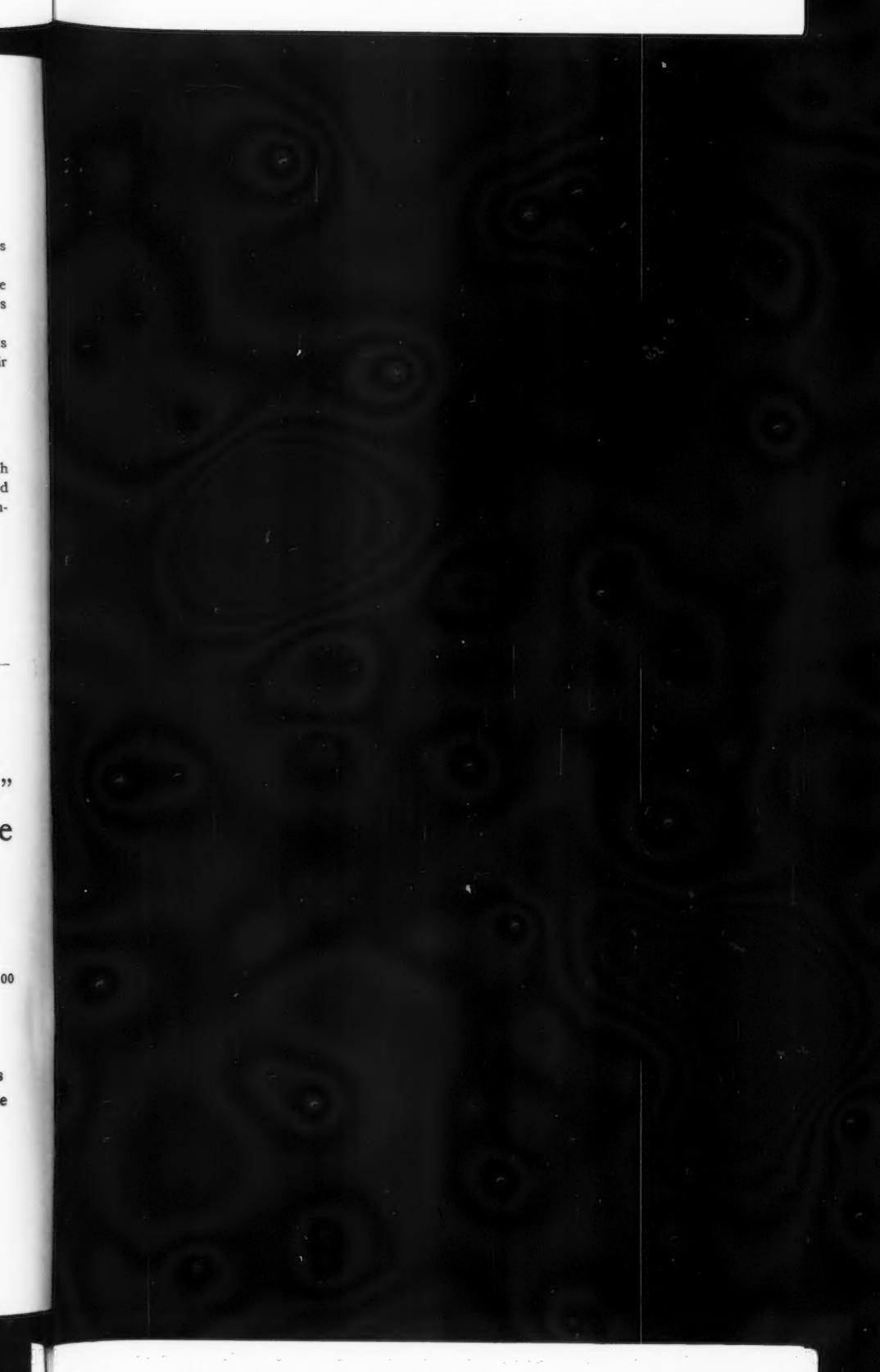

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